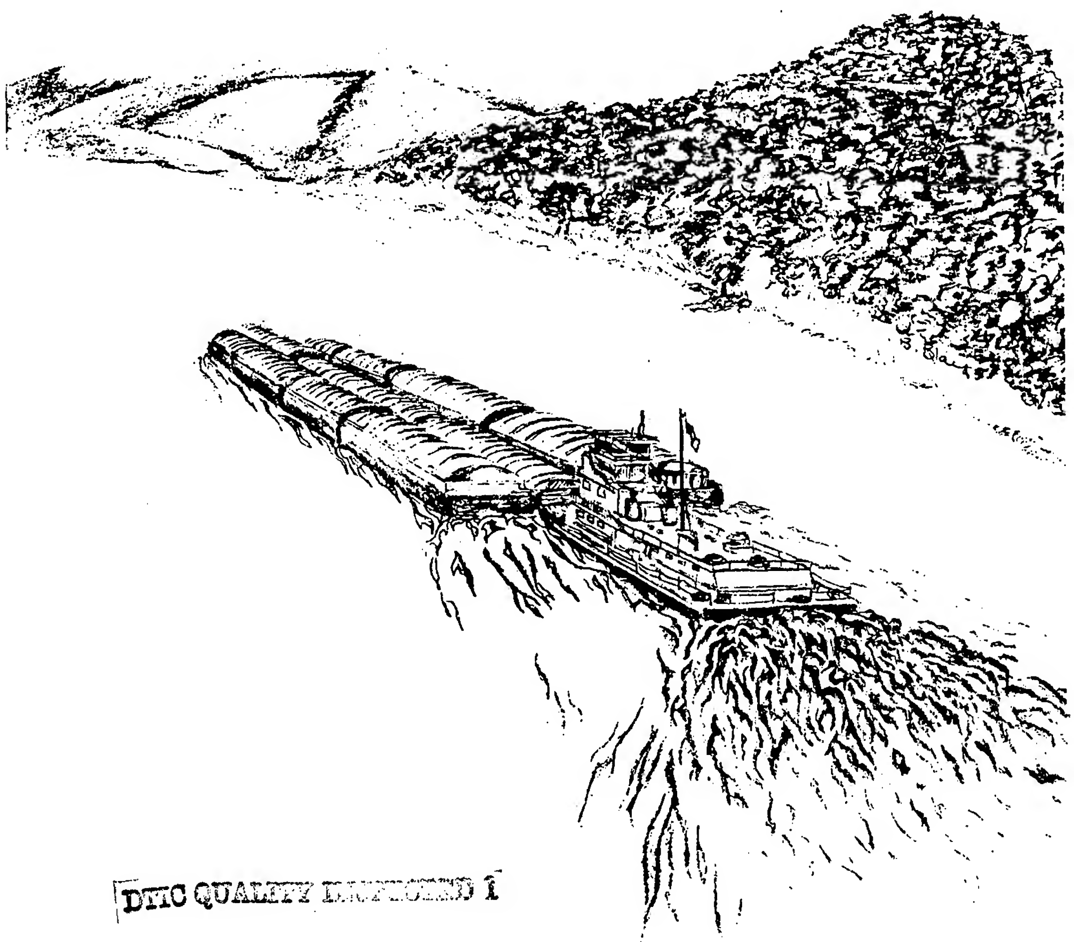
Long Term Resource Monitoring Program

Special Report
98-S001A

Physical Changes Associated with Navigation Traffic on the Illinois and Upper Mississippi Rivers (Appendices)



July 1998

LTRMP Special Reports provide Long Term Resource Monitoring Program partners with scientific and technical support. The opinions and conclusions in LTRMP Special Reports are those of the author(s) and do not necessarily reflect those of the Environmental Management Technical Center.

All reports in this series receive anonymous peer review.

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PHYSICAL CHANGES ASSOCIATED WITH NAVIGATION TRAFFIC ON THE ILLINOIS AND UPPER MISSISSIPPI RIVERS (APPENDICES)

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July 1998

Preface

The Long Term Resource Monitoring Program (LTRMP) was authorized under the Water Resources Development Act of 1986 (Public Law 99-662) as an element of the U.S. Army Corps of Engineers' Environmental Management Program. The LTRMP is being implemented by the Environmental Management Technical Center, a U.S. Geological Survey science center, in cooperation with the five Upper Mississippi River System (UMRS) States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The U.S. Army Corps of Engineers provides guidance and has overall Program responsibility. The mode of operation and respective roles of the agencies are outlined in a 1988 Memorandum of Agreement.

The UMRS encompasses the commercially navigable reaches of the Upper Mississippi River, as well as the Illinois River and navigable portions of the Kaskaskia, Black, St. Croix, and Minnesota Rivers. Congress has declared the UMRS to be both a nationally significant ecosystem and a nationally significant commercial navigation system. The mission of the LTRMP is to provide decision makers with information for maintaining the UMRS as a sustainable large river ecosystem given its multiple-use character. The long-term goals of the Program are to understand the system, determine resource trends and effects, develop management alternatives, manage information, and develop useful products.

This report was prepared under Strategy 1.2.2, *Determine Effects of Navigation on Selected Components and Processes of the Upper Mississippi River System Ecosystem*, of the Operating Plan[1] (U.S. Fish and Wildlife Service 1993). This report was developed with partial funding provided by the Long Term Resource Monitoring Program. The appendices are part two (98-S001A) of the two-part set of this report. Part one (98-S001) is the initial distribution of the report and part two is available on request.

Suggested citation:

Bhowmik, N. G., D. Soong, J. R. Adams, R. Xia, and B. S. Mazumder. 1998. Physical changes associated with navigation traffic on the Illinois and Upper Mississippi Rivers (Appendices). Prepared by Illinois State Water Survey for U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, July 1998. LTRMP 98-S001A. Appendices I–XXII

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[1]U.S. Fish and Wildlife Service. 1993. Operating Plan for the Upper Mississippi River System Long Term Resource Monitoring Program. Environmental Management Technical Center, Onalaska, Wisconsin, Revised September 1993. EMTC 91-P002R. 179 pp. (NTIS #PB94-160199)

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APPENDIX I.

WATER SURFACE SLOPES AT ALL STUDY SITES

McEver's Island Site

Date measured	*Average stage at RM 54.9, ft*	*Average stage at RM 43.1, ft*	*Water surface slope, ft/mi*
5/16/89	420.44	420.01	0.036
5/17/89	420.30	419.92	0.032
5/18/89	420.59	420.20	0.033

Average slope = 0.034 ft/mile

Kampsville Site
Trip 1

Date measured	*Average elevation at RM 43.1, ft*	*Average elevation at RM 21.6, ft*	*Water surface slope, ft/mi*
10/09/90	419.85	419.27	0.026
10/10/90	420.50	419.58	0.042
10/11/90	421.30	419.70	0.073
10/12/90	421.80	420.05	0.080
10/13/90	422.60	420.35	0.102
10/14/90	422.80	420.39	0.110
10/15/90	422.90	420.40	0.114
10/16/90	423.00	420.50	0.114
10/17/90	424.25	420.57	0.167
10/18/90	423.25	420.41	0.129

Average slope = 0.096 ft/mile

Trip 2

Date measured	*Average elevation at RM 43.1, ft*	*Average elevation at RM 21.6, ft*	*Water surface slope, ft/mi*
8/12/91	420.20	419.50	0.032
8/13/91	420.30	419.70	0.027
8/14/91	420.40	419.70	0.032
8/15/91	420.00	419.70	0.014
8/16/91	419.90	419.50	0.018

Average slope = 0.025 ft/mile

Apple River Island Site

Date measured	*Average stage at RM 552.9, ft*	*Average stage at RM 522.5, ft*	*Water surface slope, ft/mi*
5/15/90	587.85	583.06	0.158
5/16/90	588.28	583.13	0.169
5/17/90	588.56	583.27	0.174
5/18/90	588.72	583.35	0.177
5/19/90	588.77	583.26	0.181
5/20/90	588.85	582.11	0.222
5/21/90	589.07	582.82	0.206
5/22/90	589.33	582.78	0.216
5/23/90	589.59	582.94	0.219
5/24/90	589.87	583.03	0.225

Average slope = 0.195 ft/mile

Goose Island Site
Trip 1

Date measured	*Average stage at RM 324.9, ft*	*Average stage at RM 301.2, ft*	*Water surface slope, ft/mi*
8/20/90	465.08	459.35	0.242
8/21/90	466.52	459.63	0.291
8/22/90	467.99	459.63	0.353
8/23/90	468.59	459.70	0.375
8/24/90	468.38	459.52	0.374
8/25/90	468.23	459.46	0.370
8/26/90	468.29	459.49	0.371
8/27/90	468.92	459.72	0.388
8/28/90	469.57	459.65	0.419
8/29/90	470.21	459.60	0.448

Average slope = 0.363 ft/mile

Goose Island Site
Trip 2

Date measured	*Average stage at RM 324.9, ft*	*Average stage at RM 301.2, ft*	*Water surface slope, ft/mi*
7/15/91	466.78	459.47	0.308
7/16/91	466.92	459.57	0.310
7/17/91	466.96	459.59	0.311
7/18/91	466.81	459.35	0.315
7/19/91	466.39	459.29	0.300
7/20/91	466.19	459.46	0.284
7/21/91	465.84	459.44	0.270
7/22/91	465.55	459.41	0.259
7/23/91	465.52	459.49	0.254
7/24/91	465.81	459.75	0.256
7/25/91	466.21	459.71	0.274

Average slope = 0.286 ft/mile

Clarks Ferry Site
Trip 1

Date measured	*Average elevation at RM 473.75*	*Average elevation at RM 468.2*	*Water surface slope, ft/mi*
5/17/91	550.69	548.83	0.335
5/19/91	551.14	549.35	0.322
5/20/91	551.37	549.47	0.342
5/21/91	551.47	549.61	0.335
5/22/91	551.47	549.64	0.329

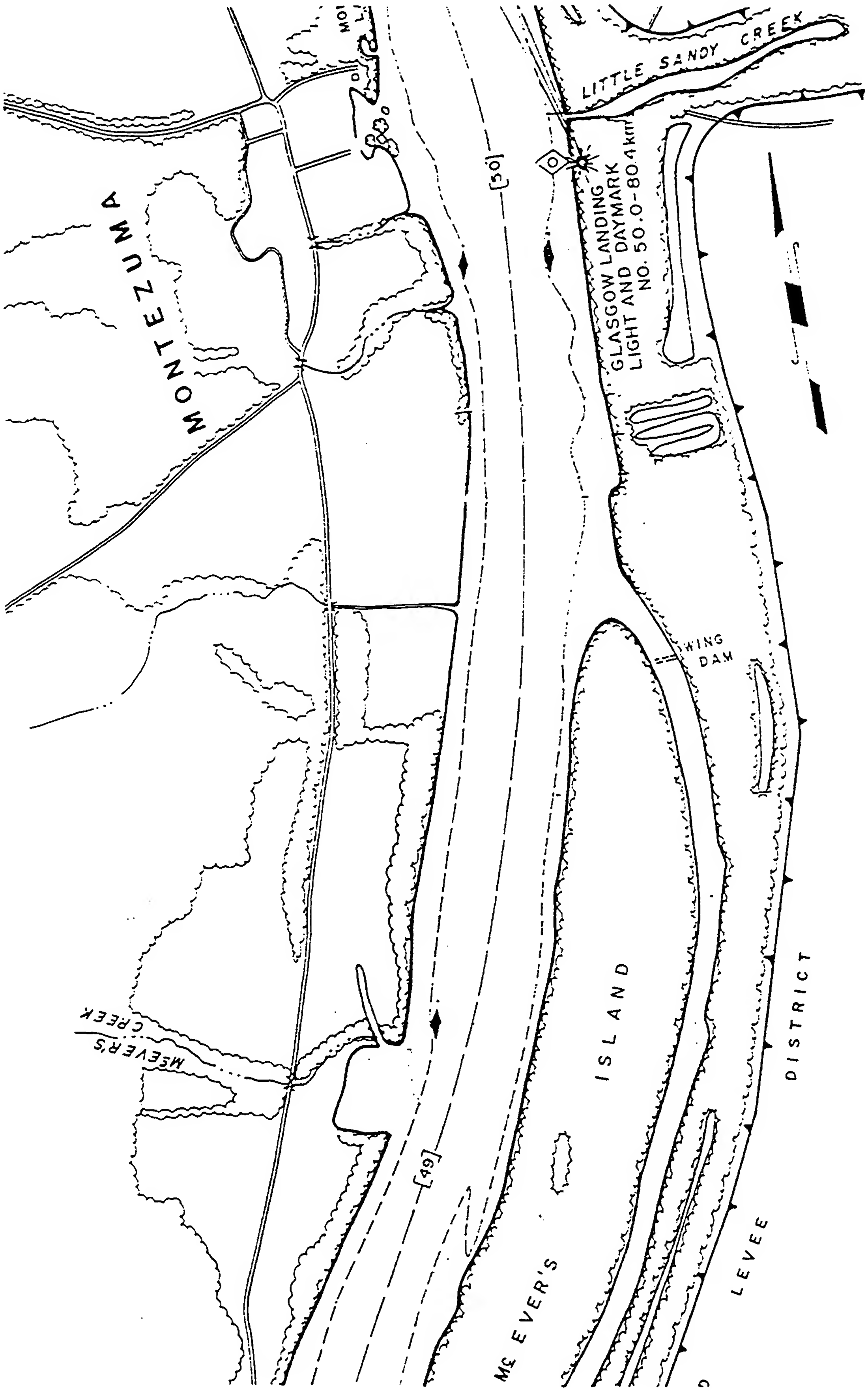
Average slope = 0.333 ft/mile

Trip 2

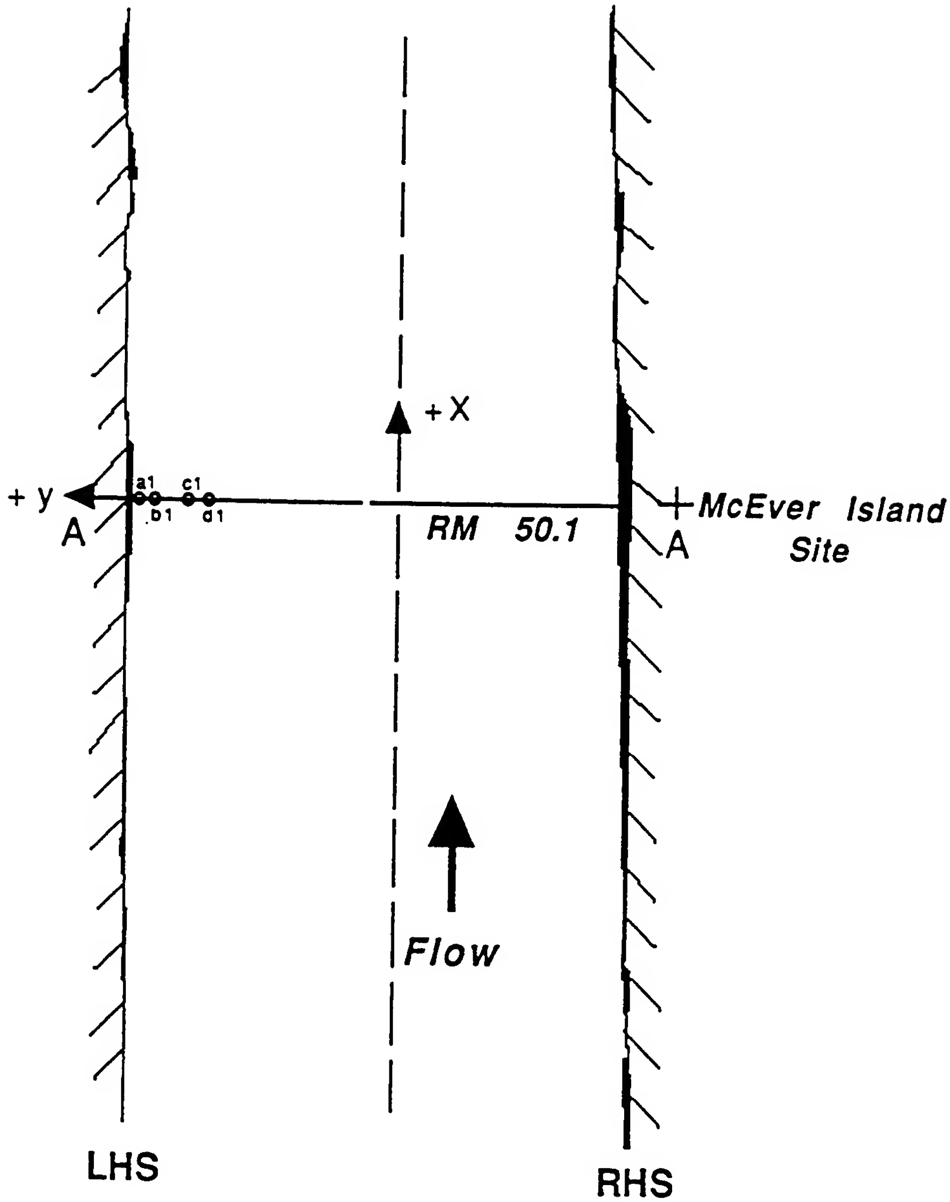
The average surface slope during this trip was 0.06 ft/mile.

APPENDIX II.

STUDY SITE LOCATIONS AND RELATIVE POSITIONS OF MEASURING SENSORS

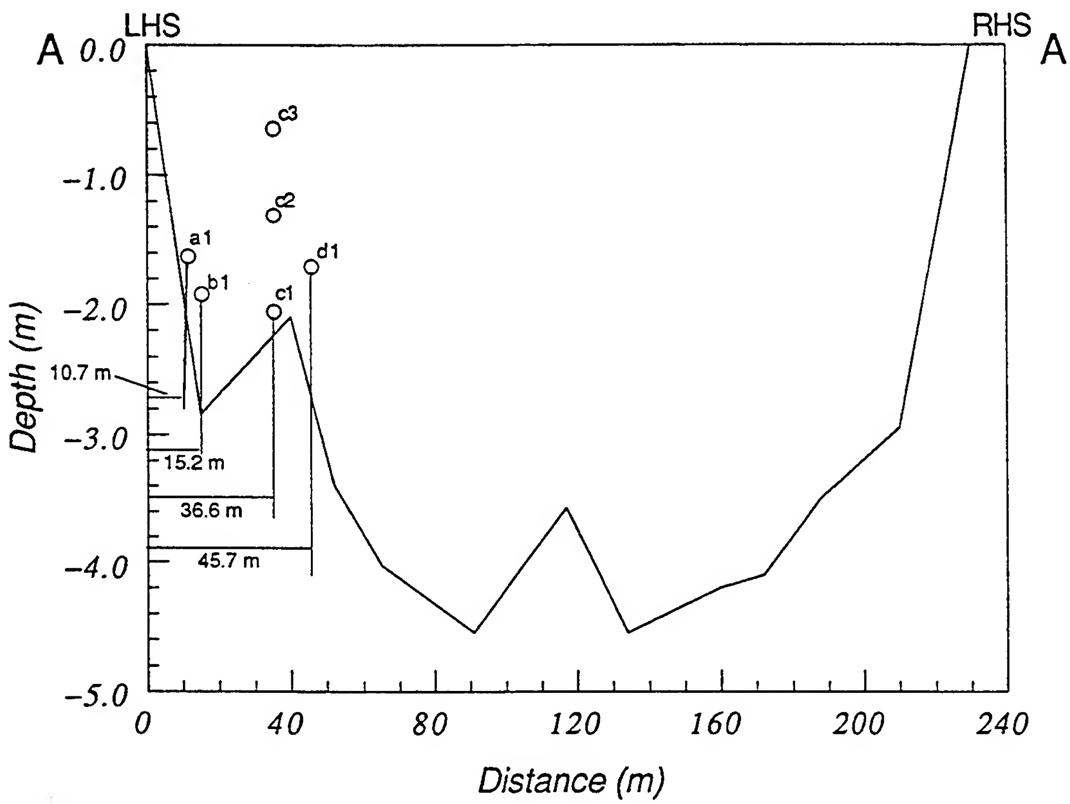


II-1. McEver's Island site on the Illinois River

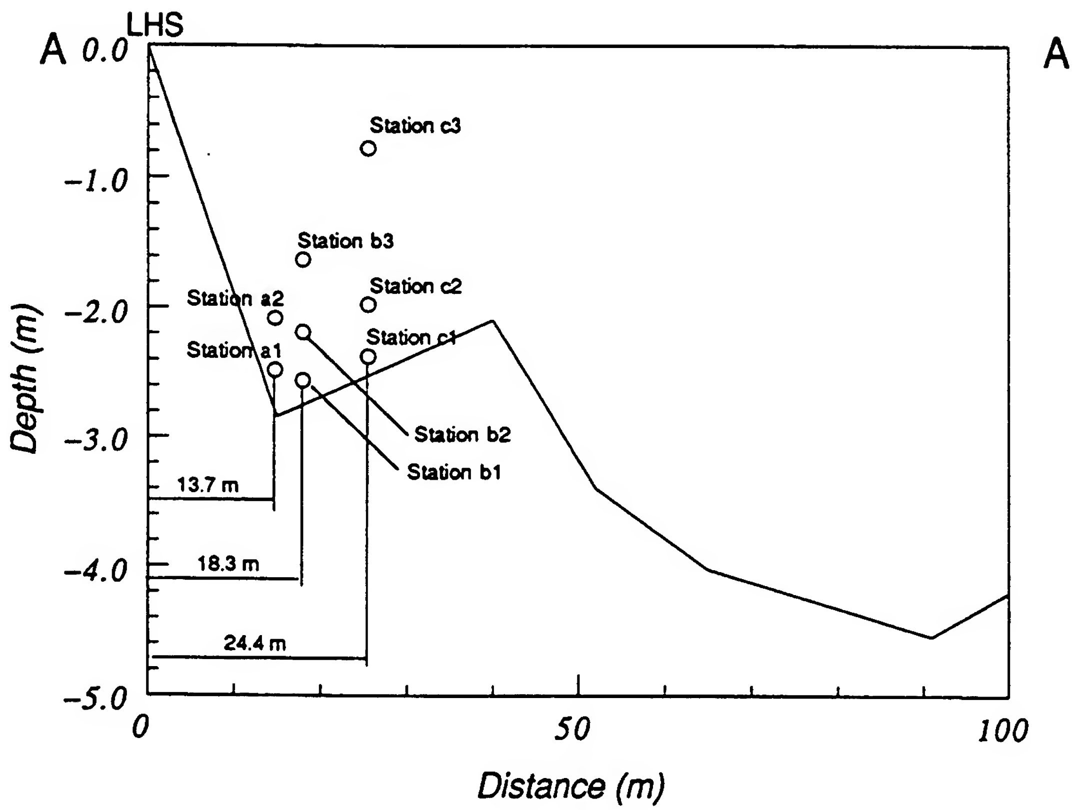


a1 - MMB511/998, 0.15 m above river bed
b1 - MMB527/642, 0.91 m above river bed
c1 - MMB511/999, 0.15 m above river bed
c2 - MMB511/1000, 0.91 m above river bed
c3 - MMB511/1001, 2.65 m above river bed
d1 - S4/071, 0.91 m above river bed

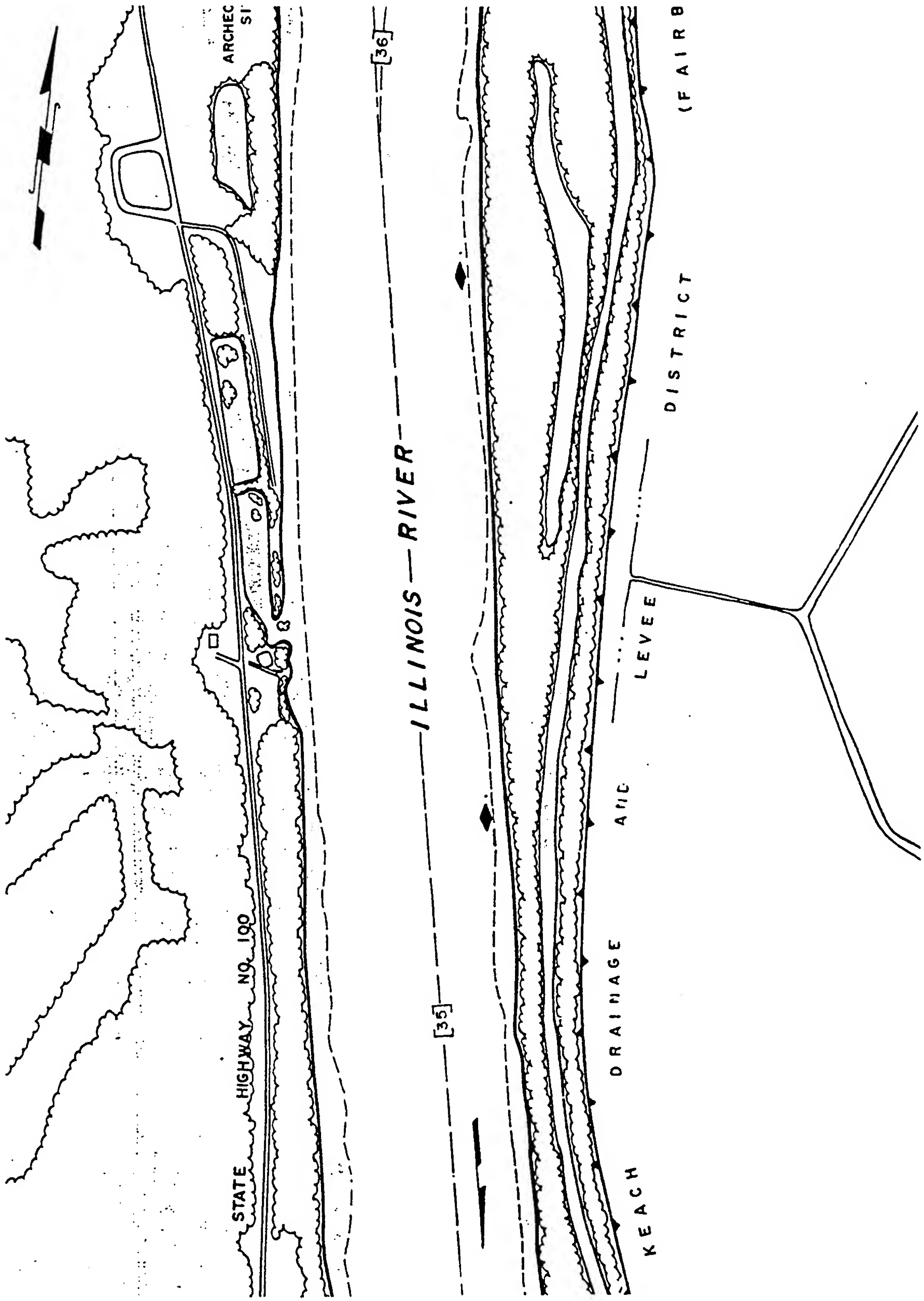
II-2. Plan view of the McEver's Island site and locations of current meters



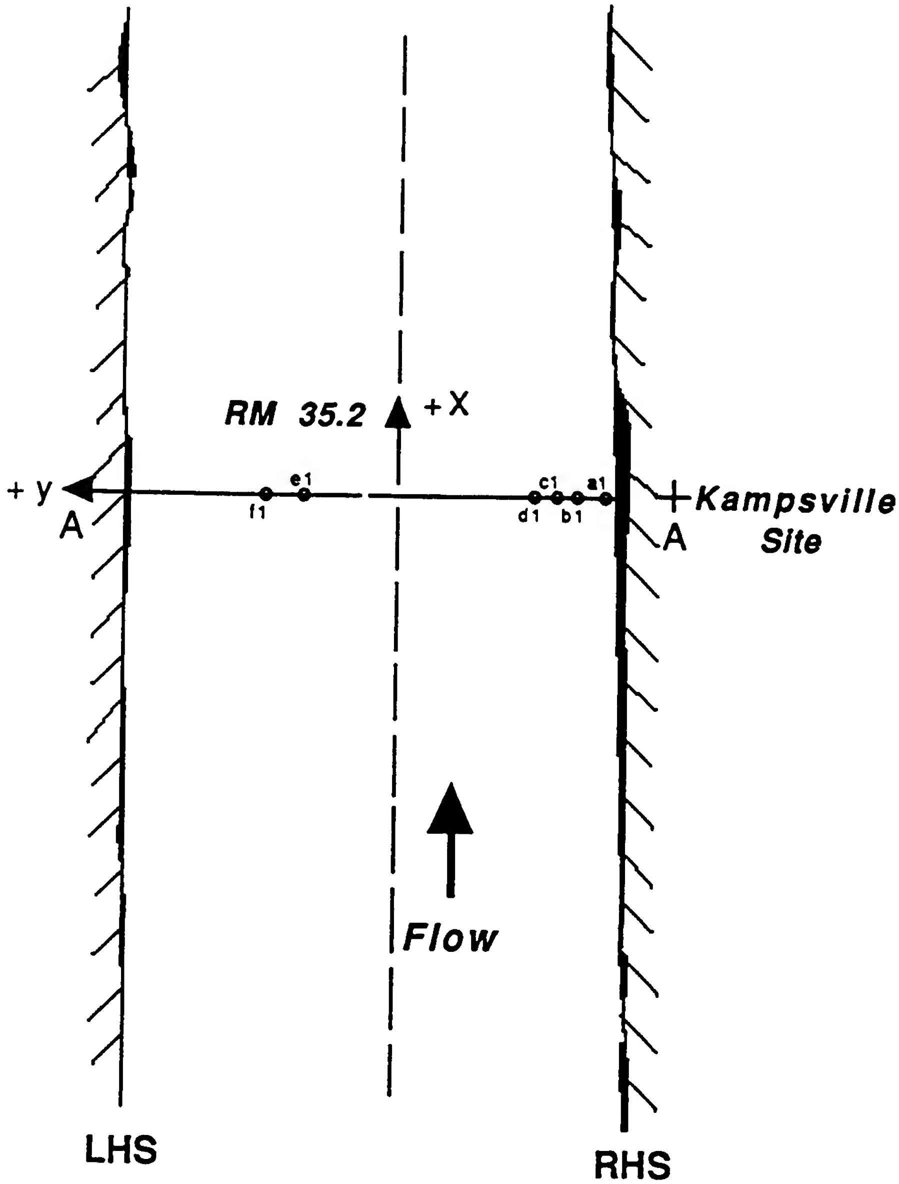
II-3. Cross section of the Illinois River at the McEver's Island site
and relative position of the current meters



II-4. Location of suspended sediment sampling stations on the Illinois River near the McEver's Island site

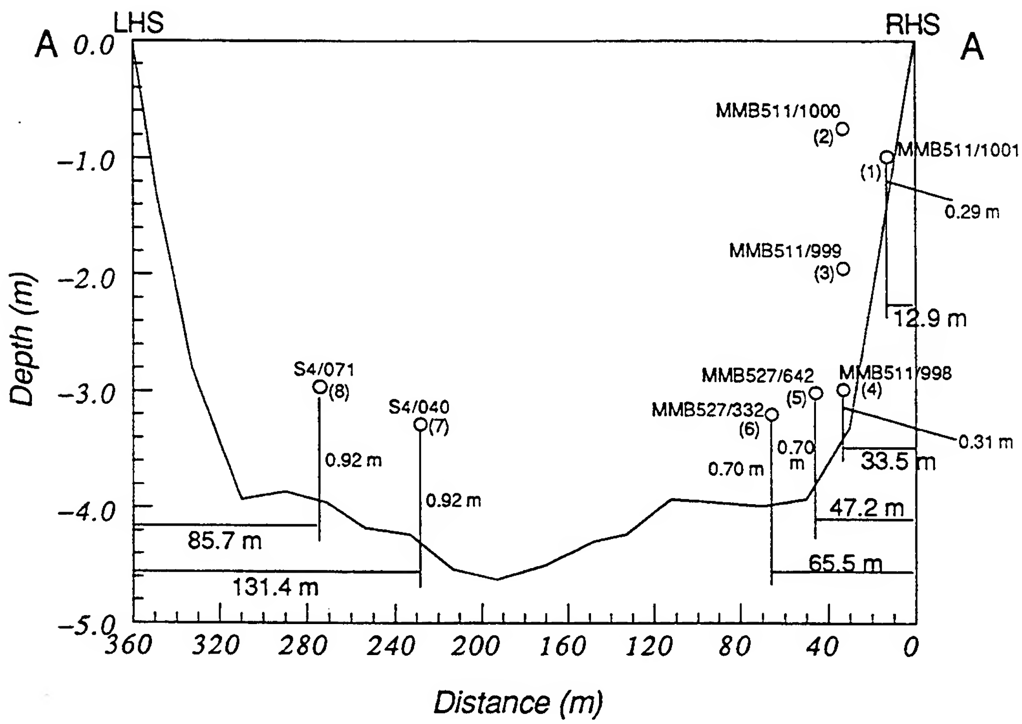


II-5. Kampsville site on the Illinois River

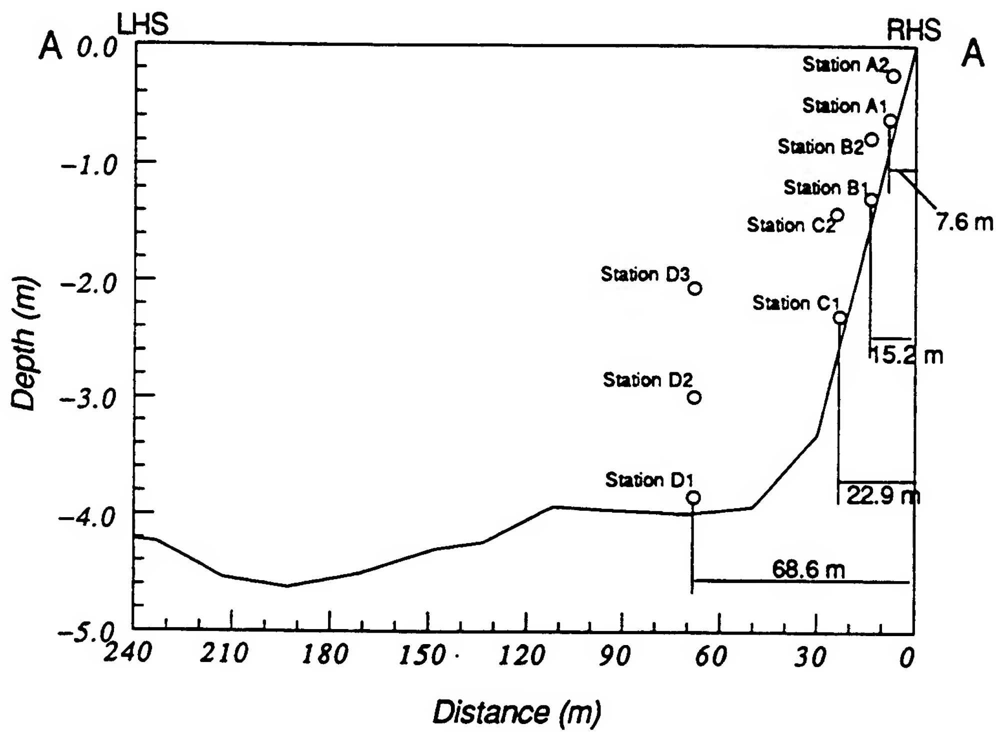


a1 - MMB511/1001, 0.29 m above river bed
b1 - MMB511/998, 0.31 m above river bed
b2 - MMB511/999, 1.22 m above river bed
b3 - MMB511/1000, 2.44 m above river bed
c1 - MMB527/642, 0.70 m above river bed
d1 - MMB527/332, 0.70 m above river bed
e1 - S4/040, 0.92 m above river bed
f1 - S4/071, 0.92 m above river bed

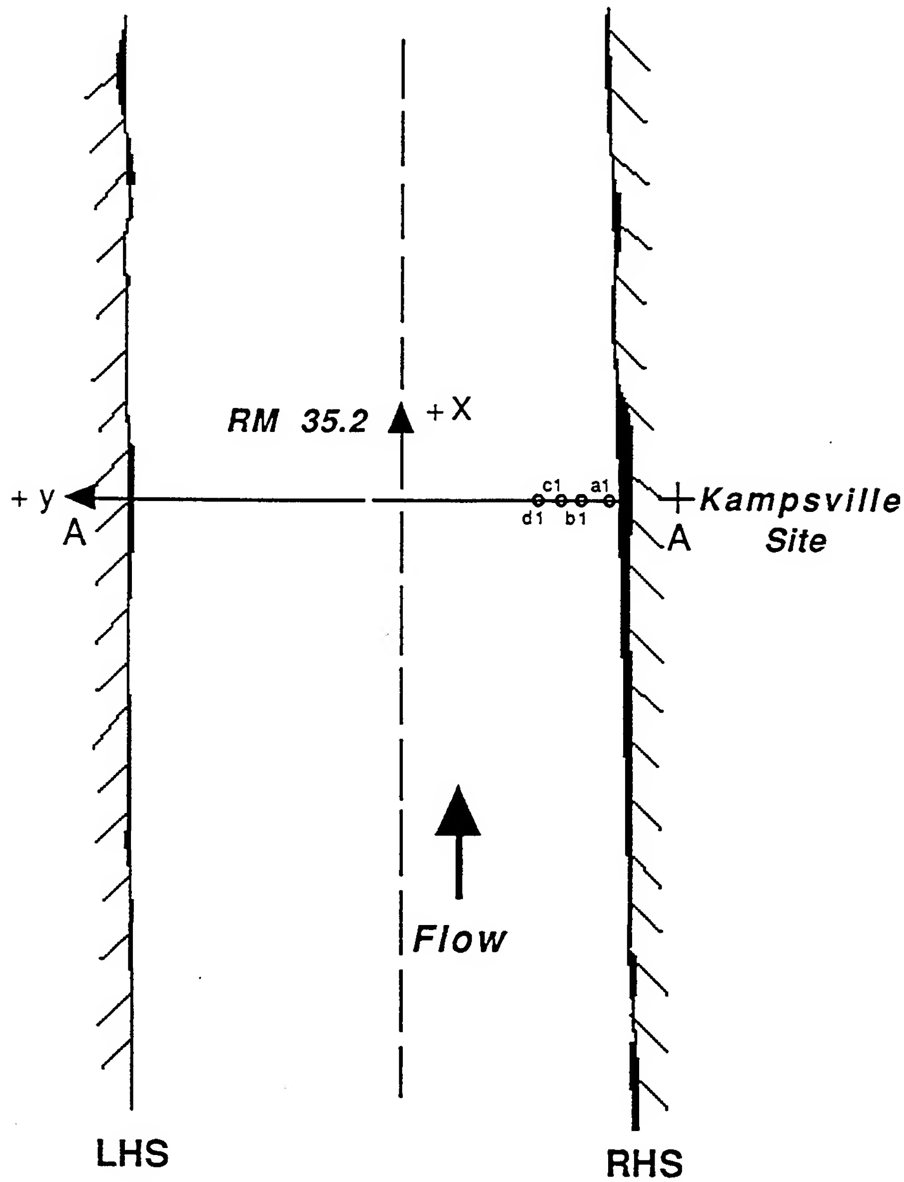
II-6. Plan view of the Kampsville site for trip 1
and locations of current meters



II-7. Cross section of the Illinois River at the Kampsville site for trip 1

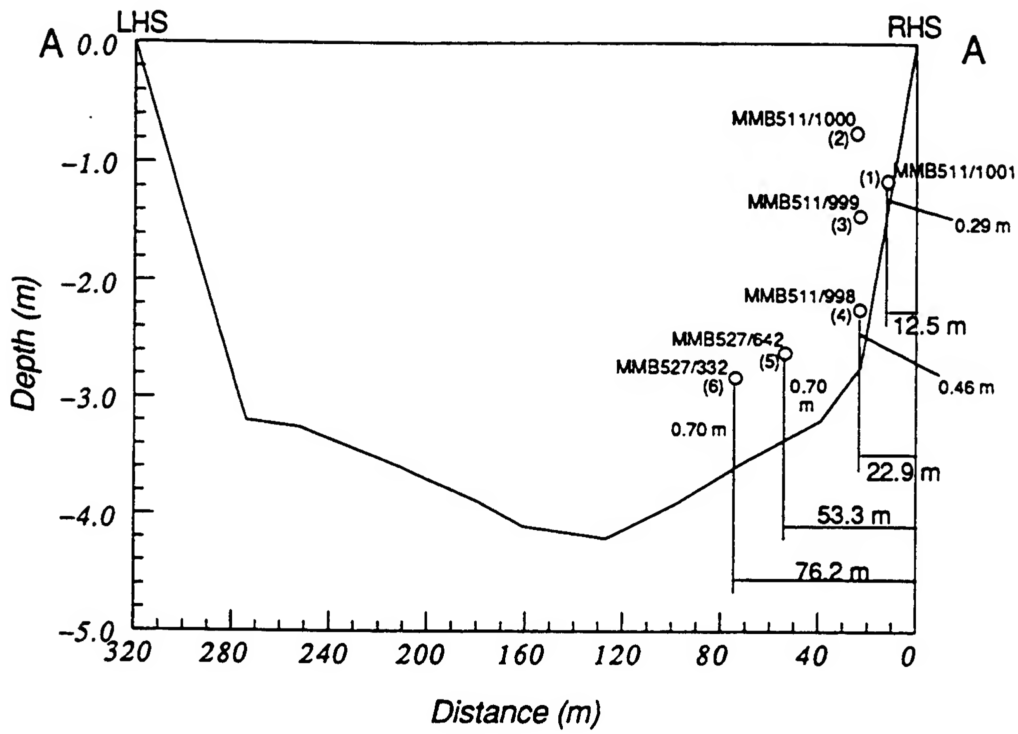


II-8. Location of suspended sediment sampling stations on the Illinois River near the Kampsville site during trip 1

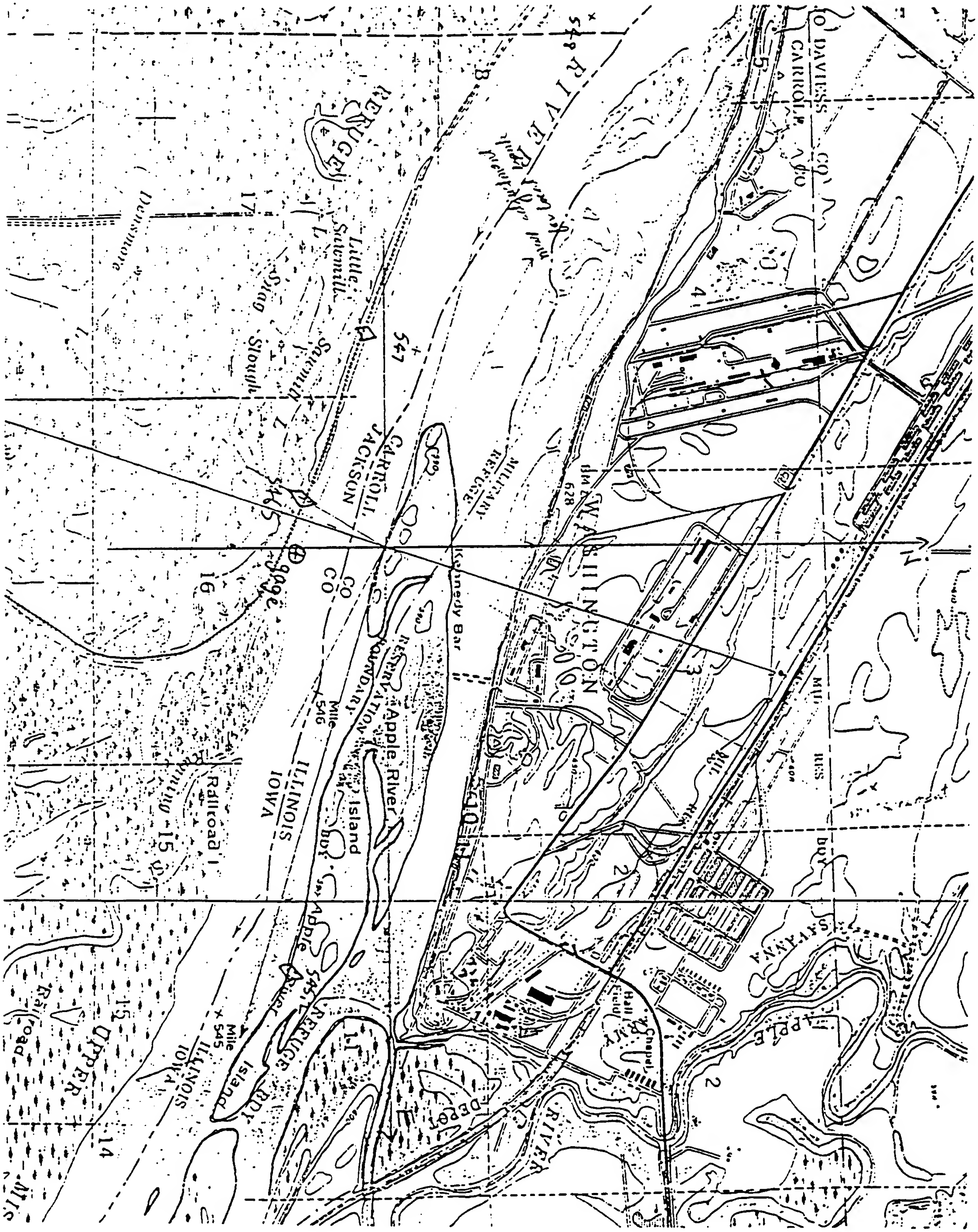


a1 - MMB511/1001, 0.29 m above river bed
b1 - MMB511/998, 0.46 m above river bed
b2 - MMB511/999, 1.31 m above river bed
b3 - MMB511/1000, 2.13 m above river bed
c1 - MMB527/642, 0.70 m above river bed
d1 - MMB527/332, 0.70 m above river bed

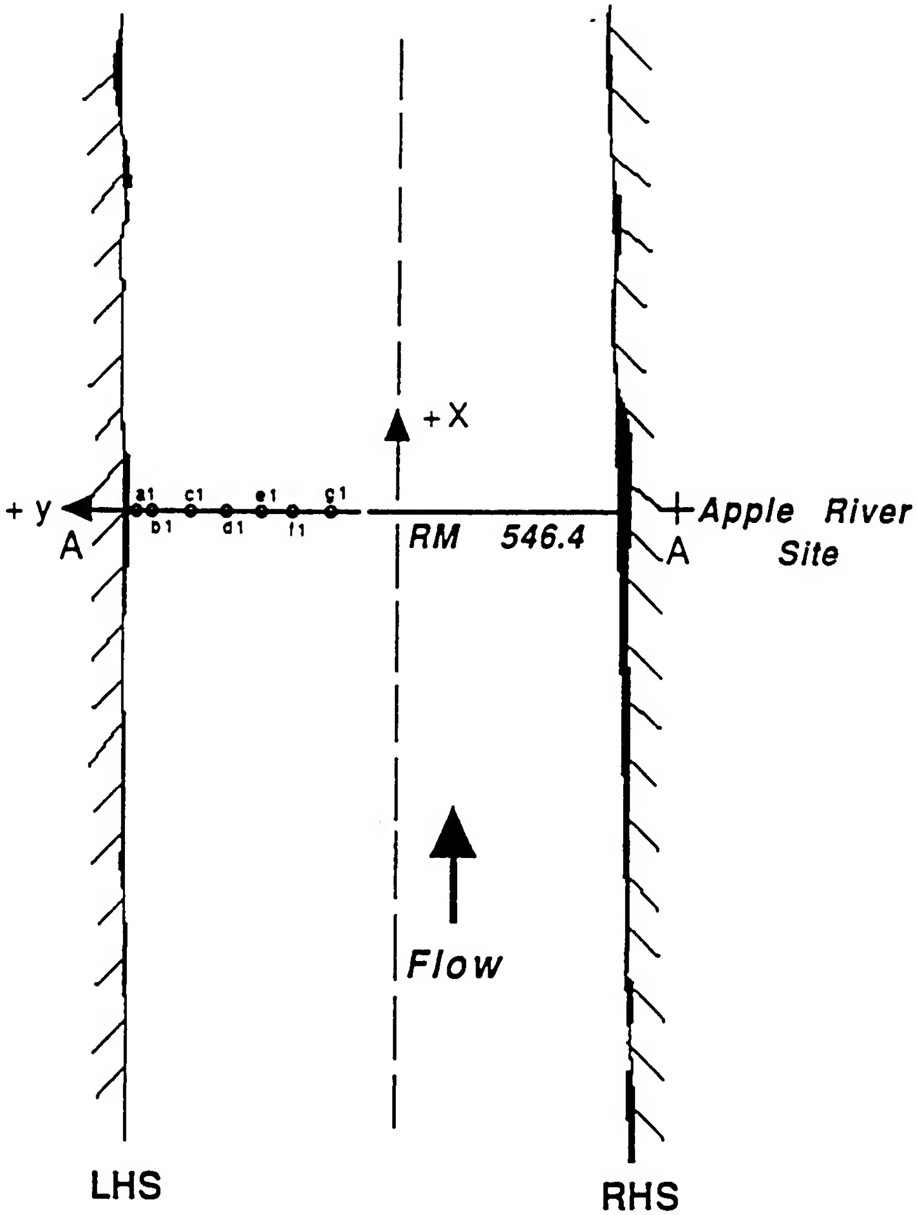
II-9. Plan view of Kampsville site for trip 2
and locations of current meters



II-10. Cross section of the Illinois River at the Kampsville site for trip 2

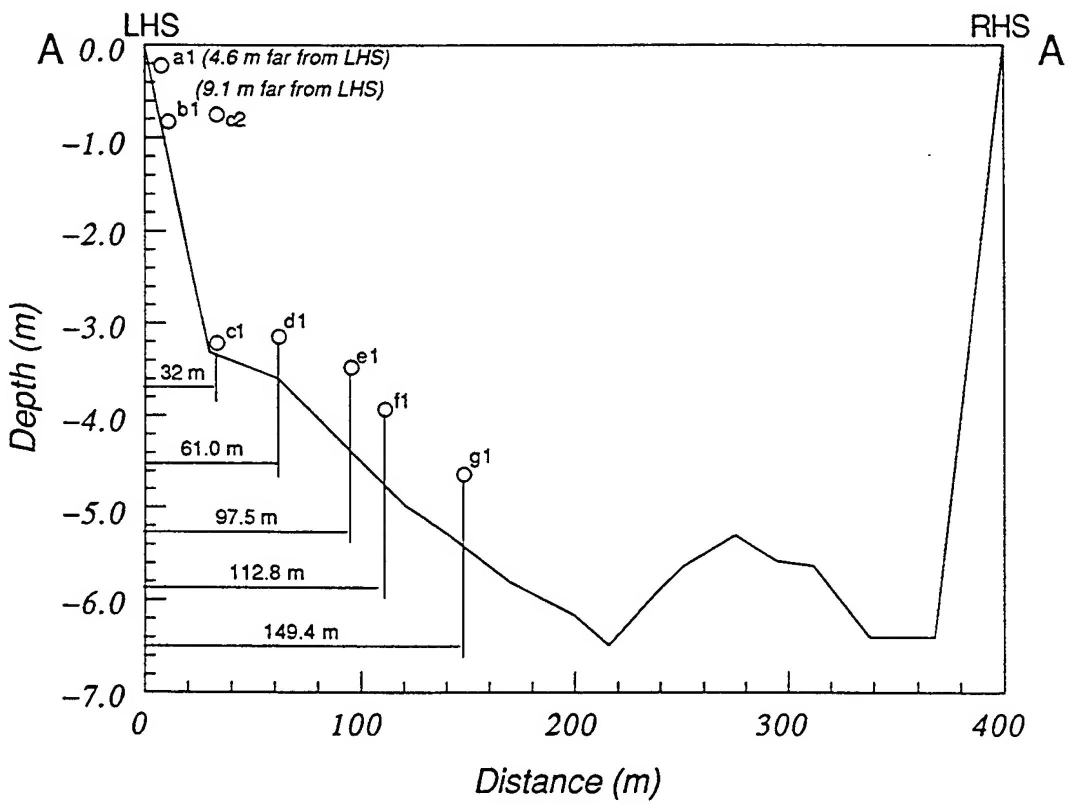


II-11. Apple River Island site on the Mississippi River

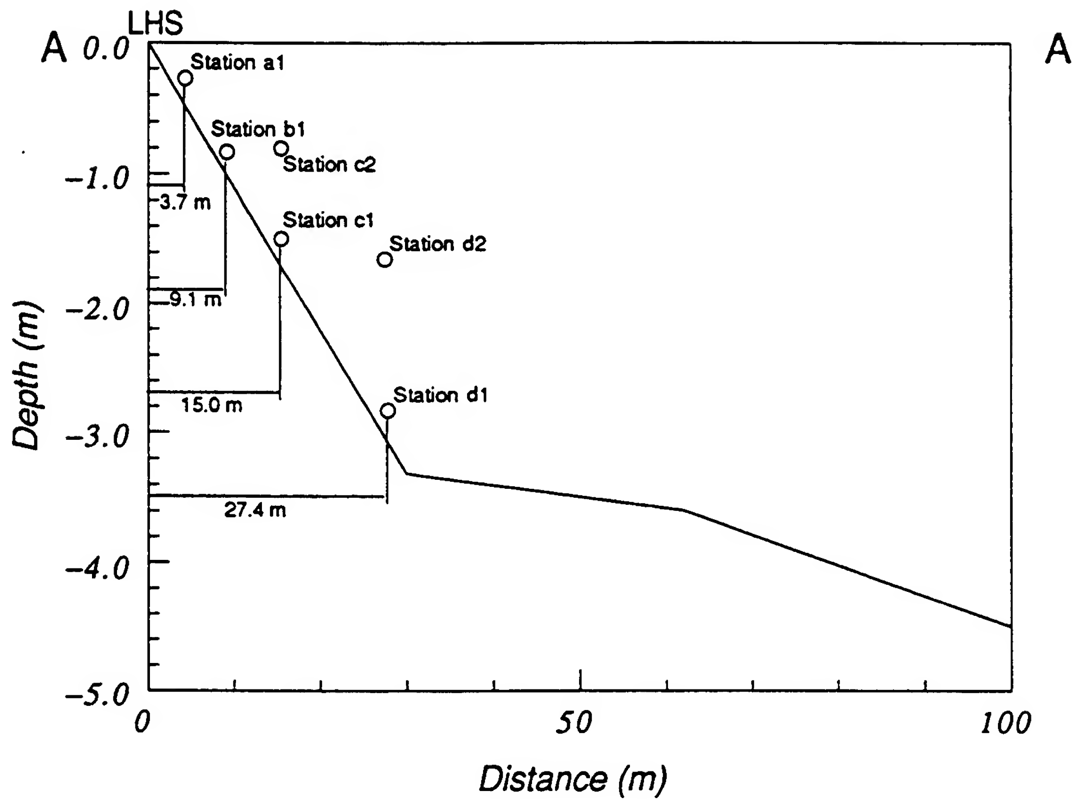


a1 - MMB511/1001, 0.20 m above river bed
b1 - MMB511/1000, 0.22 m above river bed
c1 - MMB511/998, 0.15 m above river bed
c2 - MMB511/999, 2.74 m above river bed
d1 - MMB527/642, 0.46 m above river bed
e1 - MMB527/332, 0.91 m above river bed
f1 - S4/071, 0.91 m above river bed
g1 - S4/040, 0.91 m above river bed

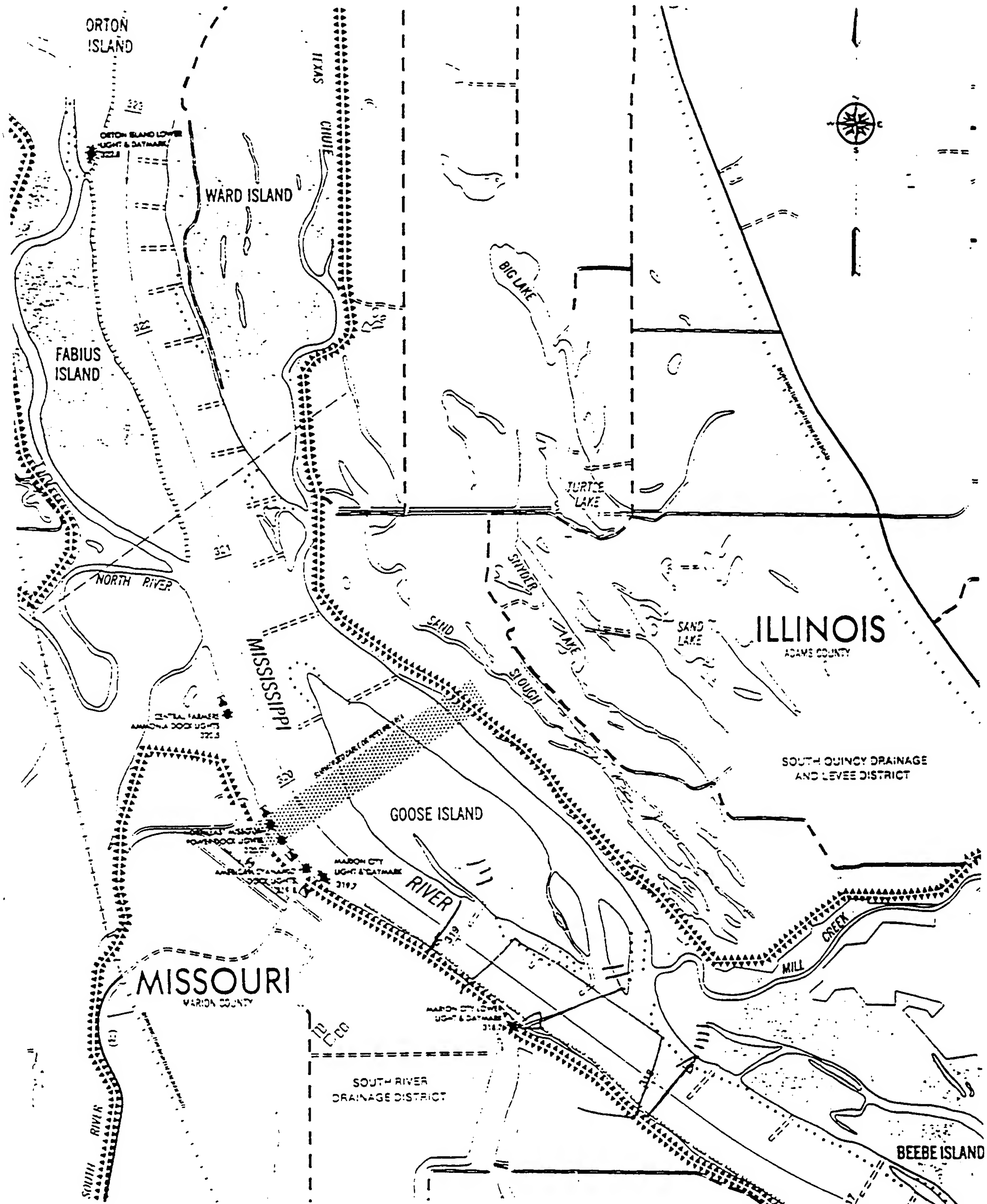
II-12. Plan view of the Apple River Island site and locations of current meters



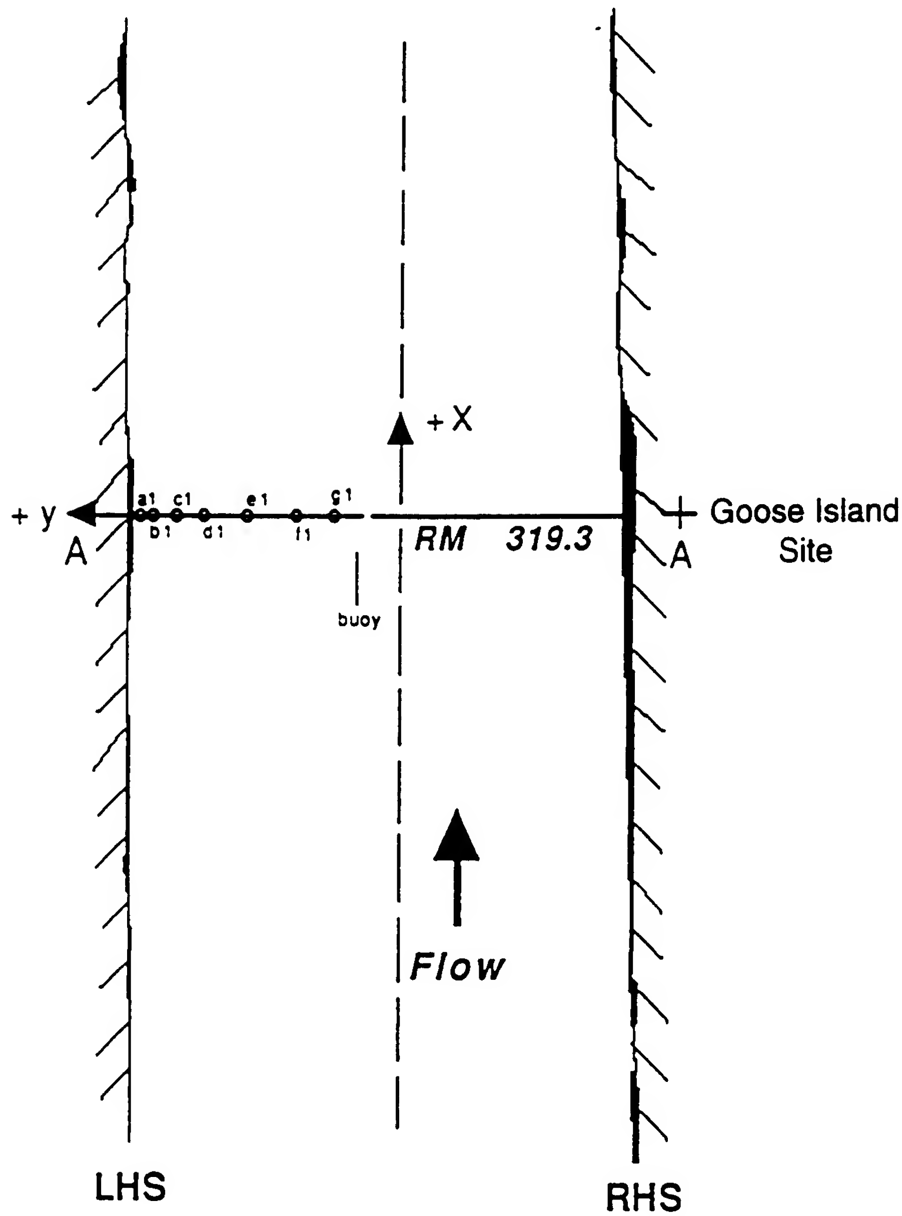
II-13. Cross section of the Mississippi River at the Apple River Island site



II-14. Location of suspended sediment sampling stations on the Mississippi River near the Apple River Island site

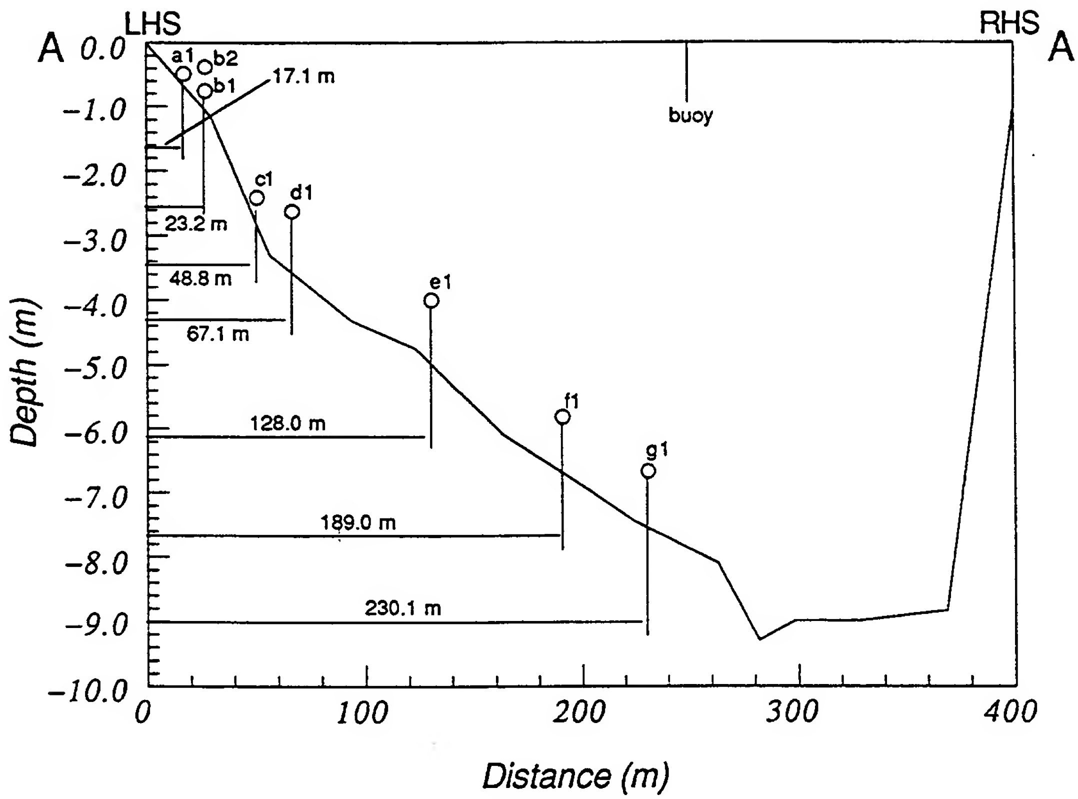


II-15. Goose Island site on the Mississippi River

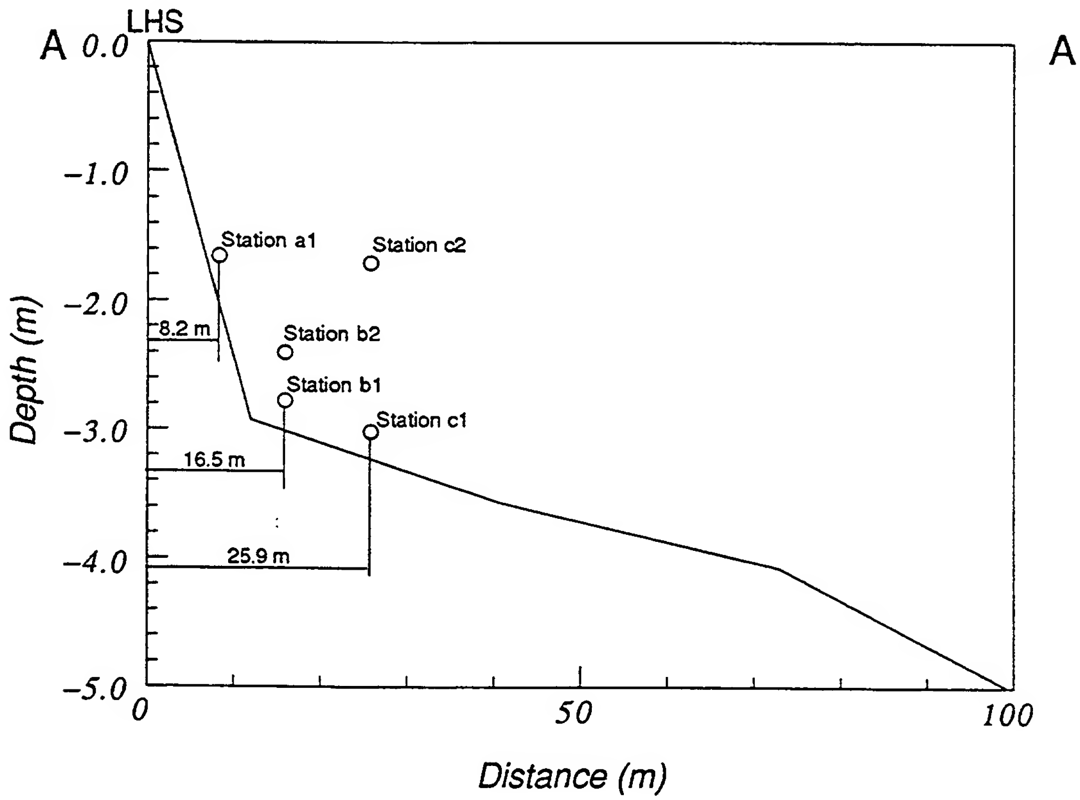


a1 - MMB511/1000, 0.18 m above river bed
b1 - MMB511/998, 0.25 m above river bed
b2 - MMB511/999, 0.61 m above river bed
c1 - MMB511/1001, 0.25 m above river bed
d1 - MMB527/642, 0.91 m above river bed
e1 - MMB527/332, 0.91 m above river bed
f1 - S4/040, 0.91 m above river bed
g1 - S4/071, 0.91 m above river bed

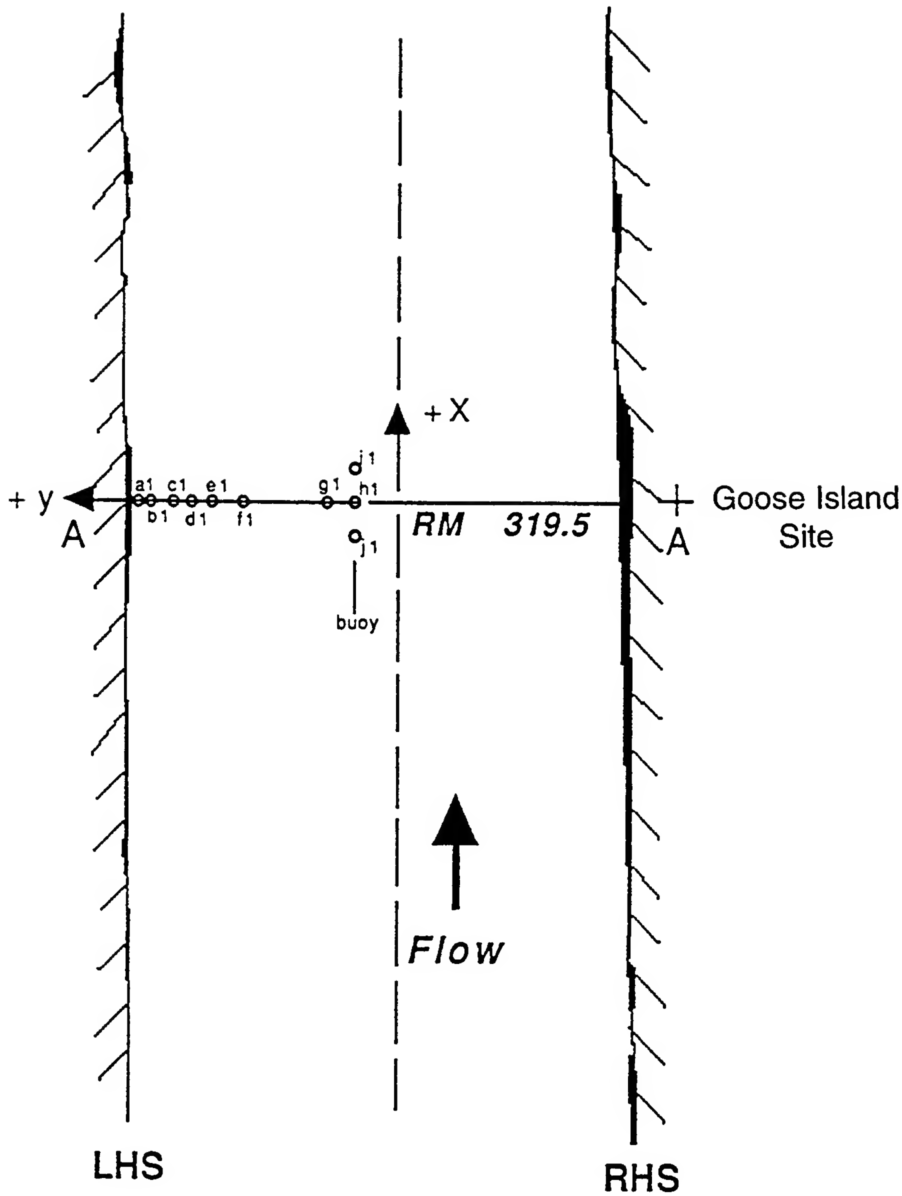
II-16. Plan view of the Goose Island site and locations of current meters for trip 1



II-17. Cross section of the Mississippi River
at the Goose Island site during trip 1

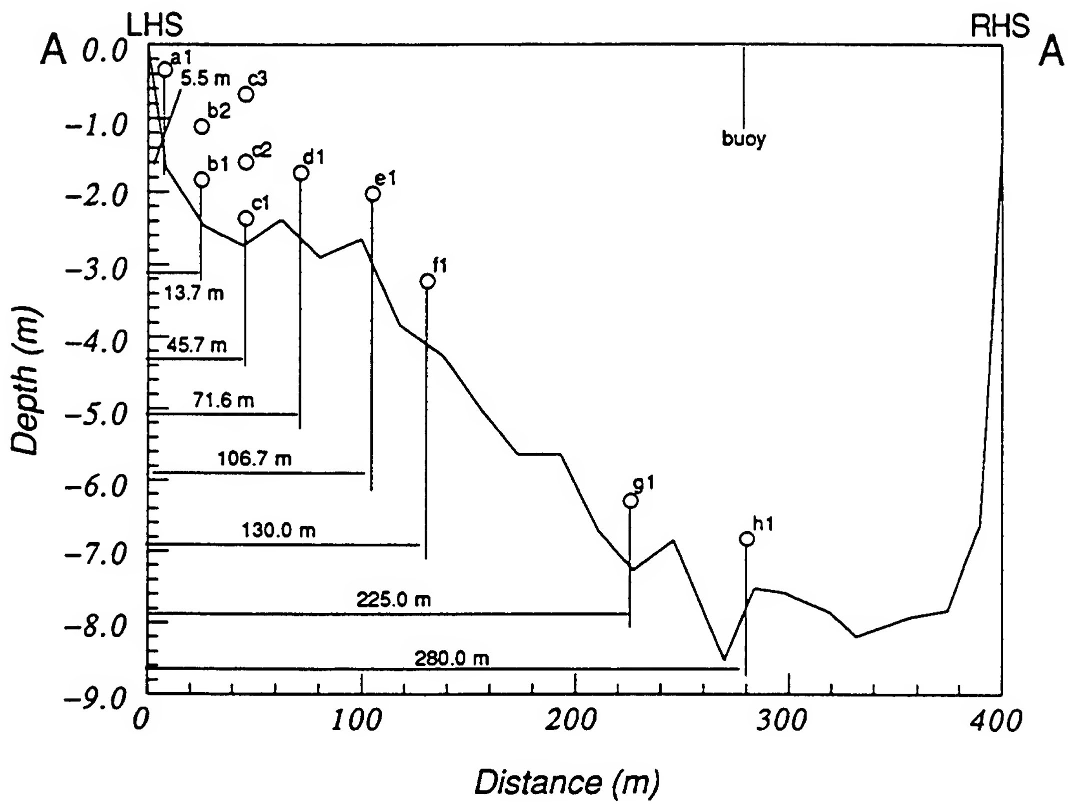


II-18. Location of suspended sediment sampling stations
on the Mississippi River near the Goose Island site during trip 1

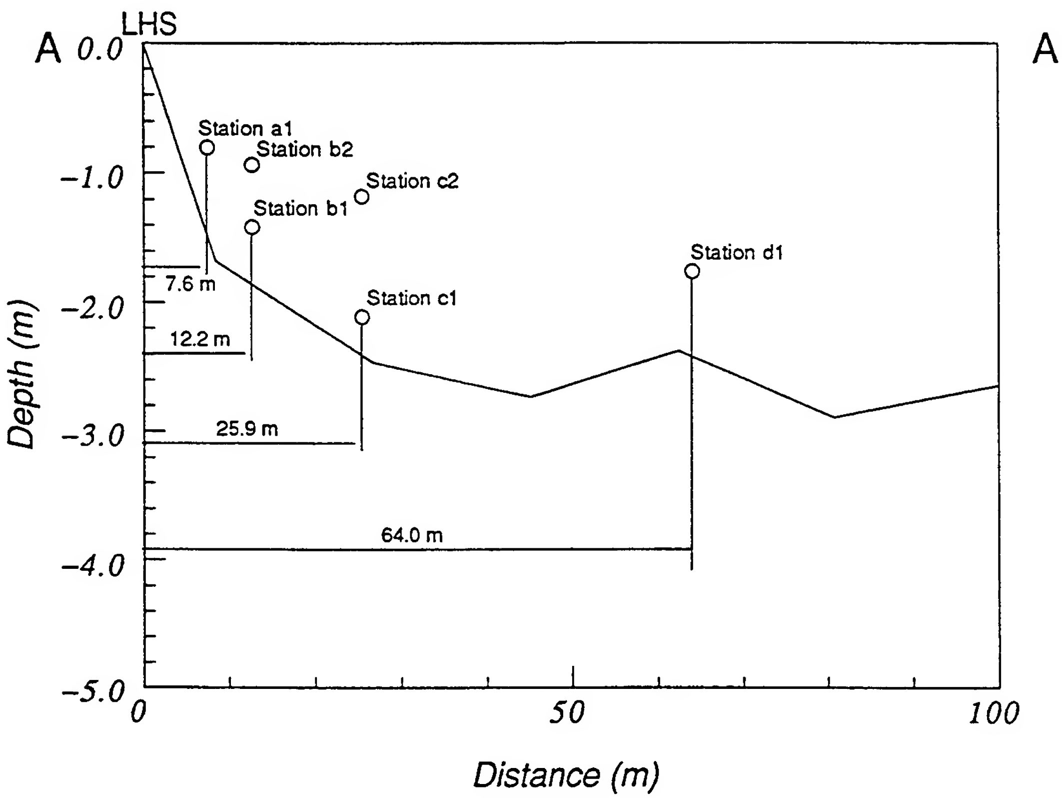


a1 - MMB511/998, 0.69 m above river bed
b1 - MMB511/1000, 0.61 m above river bed
b2 - MMB511/999, 1.34 m above river bed
c1 - MMB511/1130, 0.46 m above river bed
c2 - MMB511/1131, 1.28 m above river bed
c3 - MMB511/1001, 2.13 m above river bed
d1 - MMB527/642, 0.91 m above river bed
e1 - MMB527/332, 0.91 m above river bed
f1 - S4/071, 0.91 m above river bed
g1 - S4/834, 0.91 m above river bed
h1 - S4/040, 0.91 m above river bed
i1 - S4/832, 0.91 m above river bed
j1 - S4/151, 0.91 m above river bed

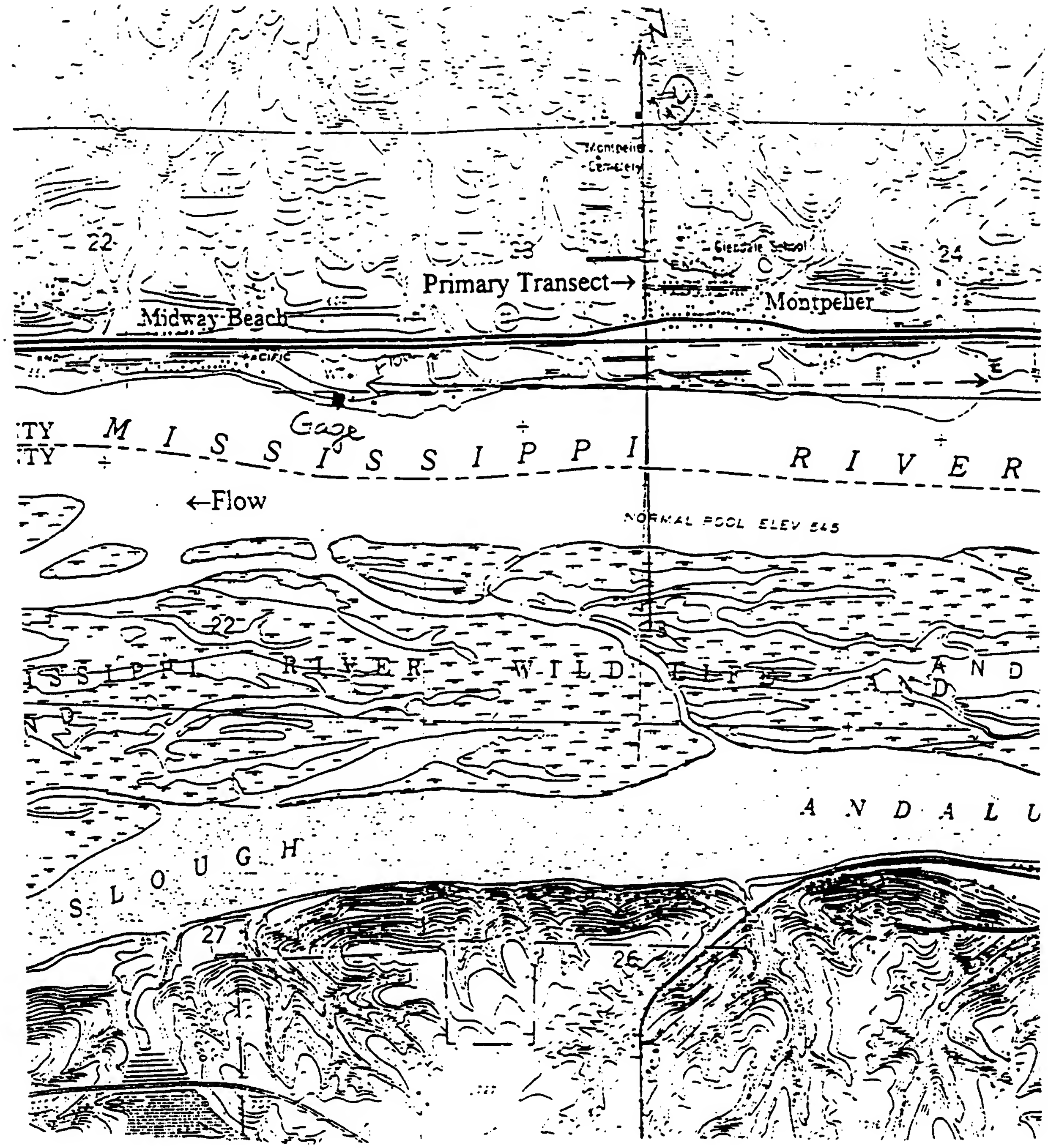
II-19. Plan view of the Goose Island site and locations of current meters for trip 2



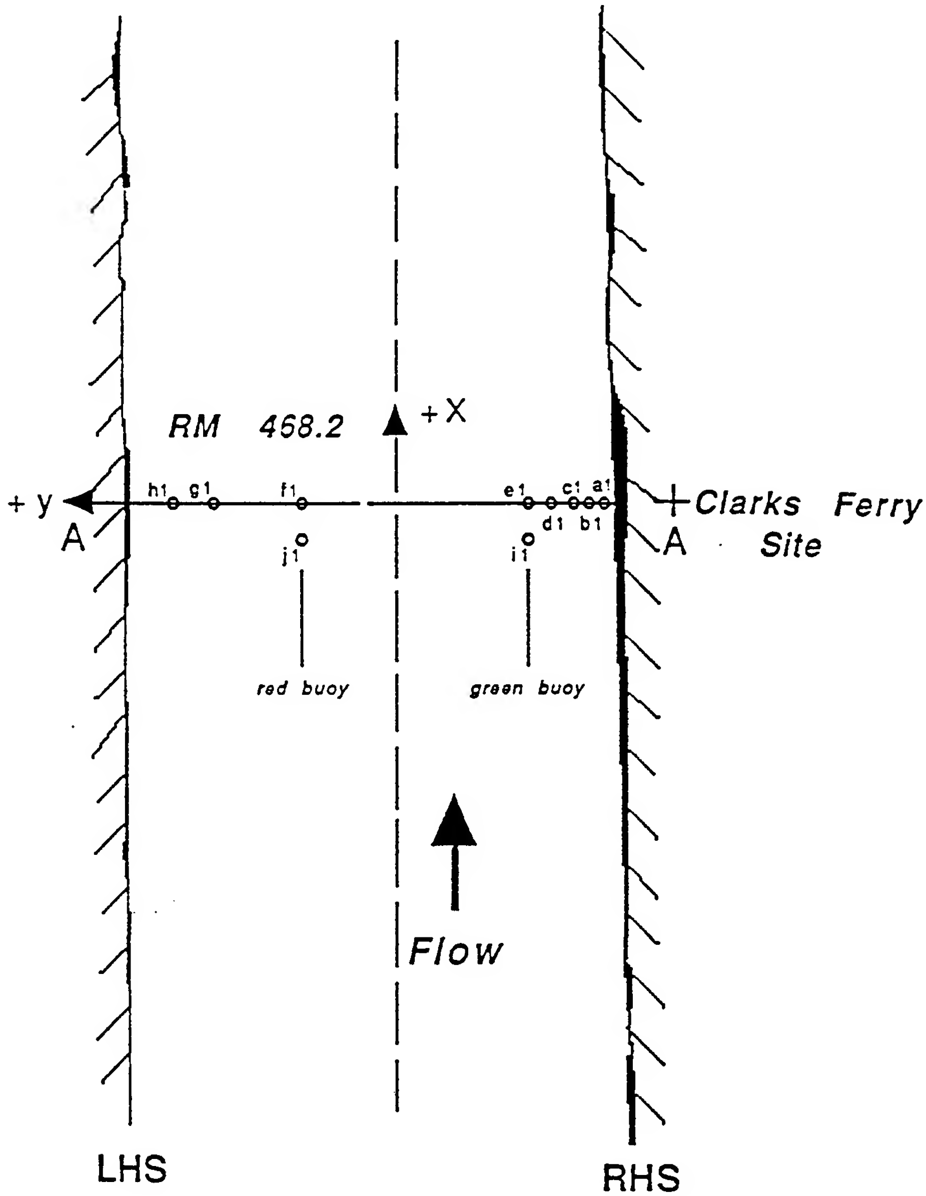
II-20. Cross section of the Mississippi River
at the Goose Island site during trip 2



II-21. Location of suspended sampling stations
on the Mississippi River near the Goose Island site during trip 2

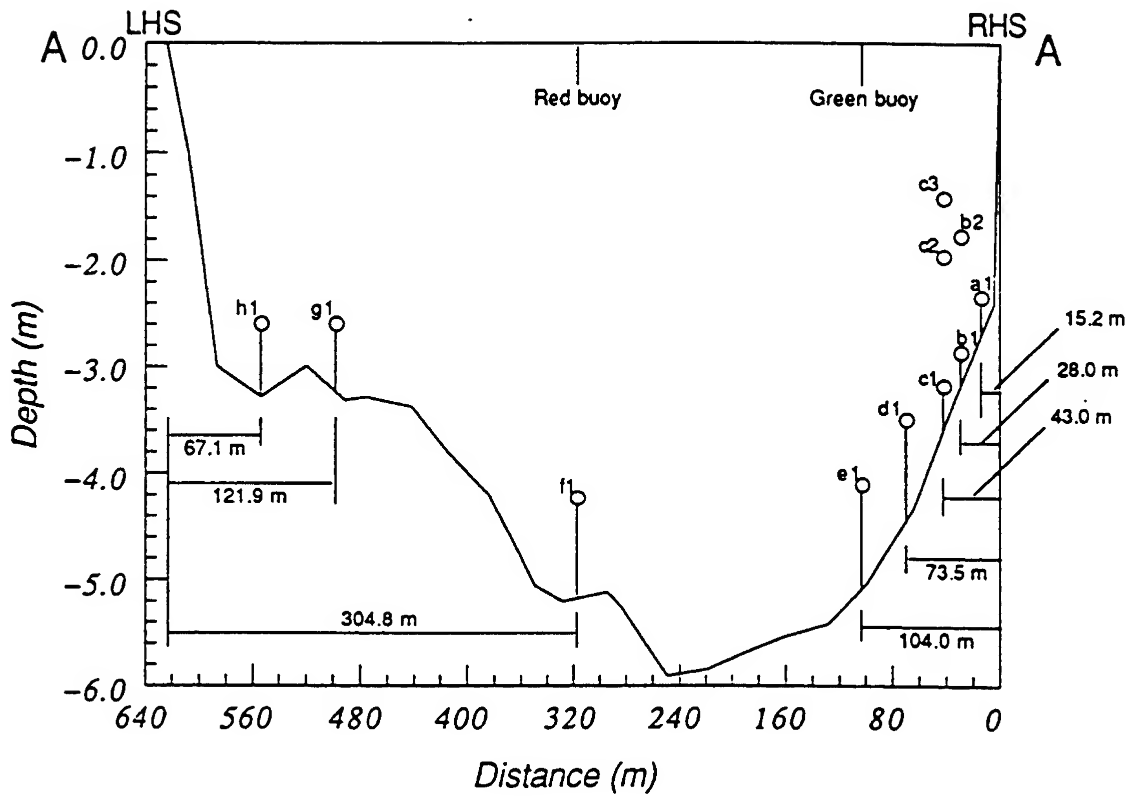


II-22. Clarks Ferry site on the Mississippi River

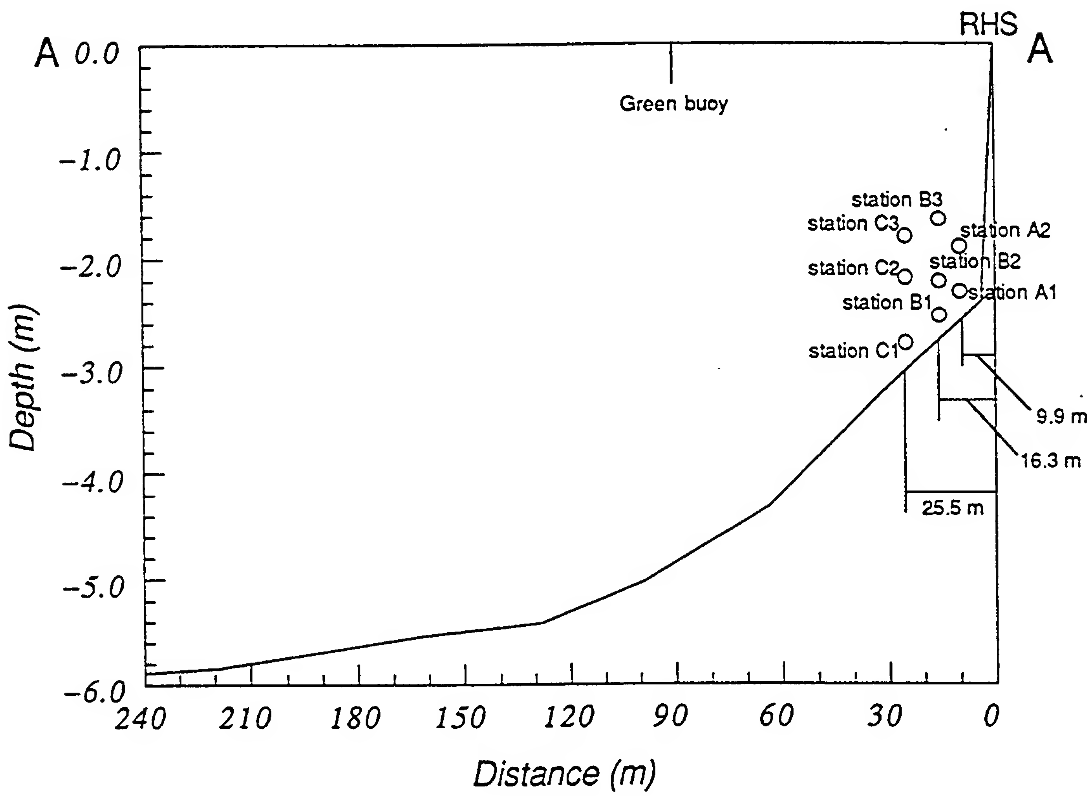


a1 - MMB511/1001, 0.35 m above river bed
b1 - MMB511/1330, 0.33 m above river bed
b2 - MMB511/1331, 1.52 m above river bed
c1 - MMB511/998, 0.36 m above river bed
c2 - MMB511/999, 1.62 m above river bed
c3 - MMB511/1000, 2.53 m above river bed
d1 - S4/151, 1.0 m above river bed
e1 - S4/834, 1.0 m above river bed
f1 - S4/040, 1.0 m above river bed
g1 - MMB527/332, 0.70 m above river bed
h1 - MMB527/642, 0.70 m above river bed
i1 - S4/832, 1.0 m above river bed
j1 - S4/071, 1.0 m above river bed

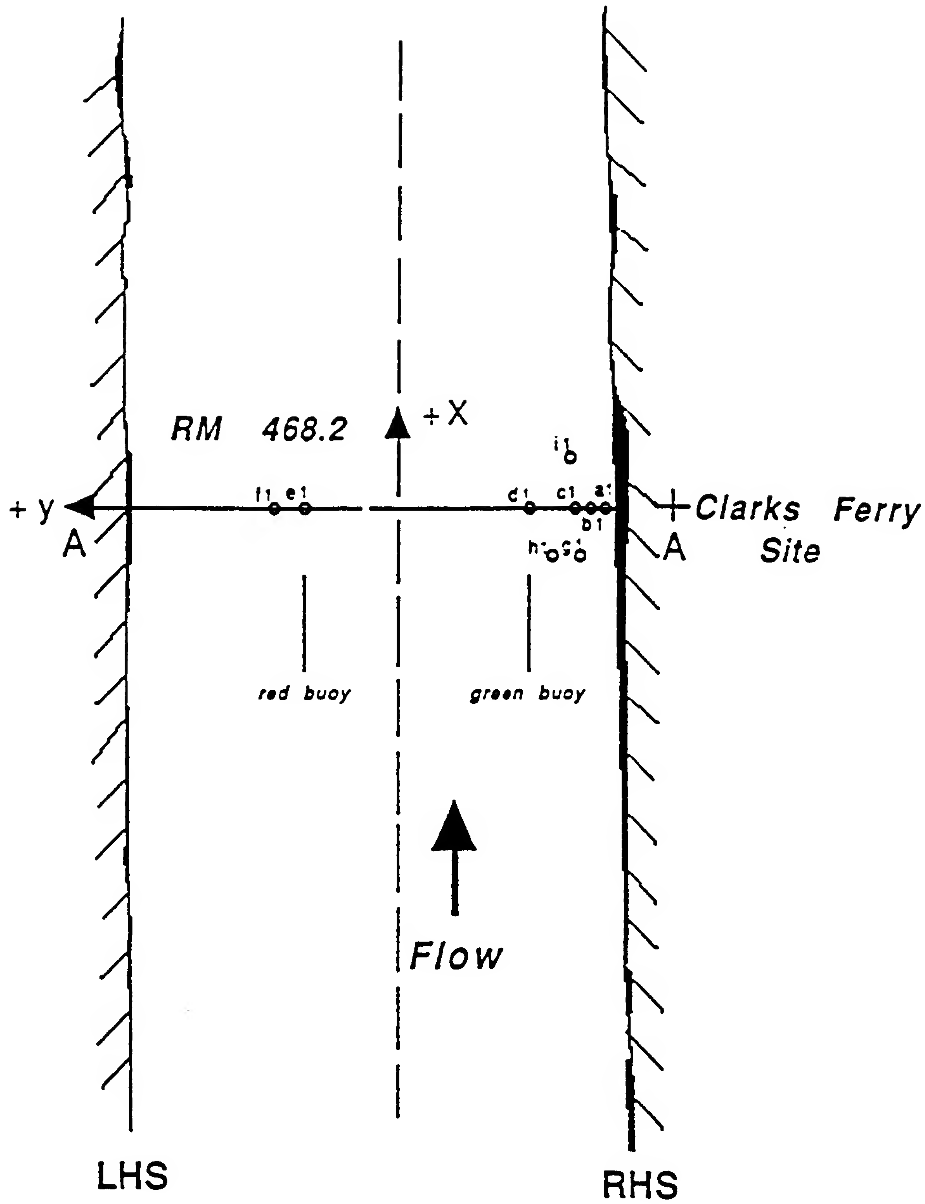
II-23. Plan view of the Clarks Ferry site for trip 1 and locations of current meters



II-24. Cross section of the Mississippi River at the Clarks Ferry site for trip 1

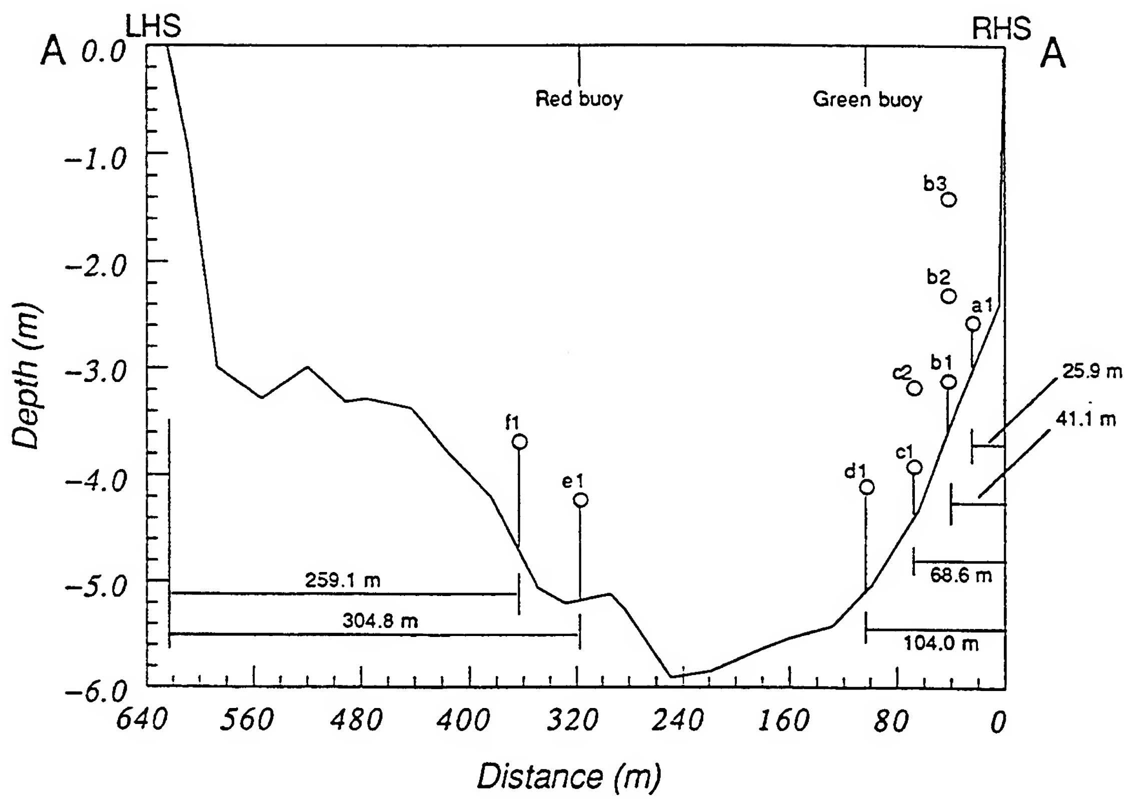


II-25. Location of suspended sediment sampling stations on the Mississippi River near the Clarks Ferry site during trip 1



a1 - MMB511/1001, 0.46 m above river bed
b1 - MMB511/998, 0.51 m above river bed
b2 - MMB511/999, 1.24 m above river bed
b3 - MMB511/1000, 2.16 m above river bed
c1 - MMB511/1130, 0.50 m above river bed
c2 - MMB511/1131, 1.21 m above river bed
d1 - S4/834, 1.0 m above river bed
e1 - S4/151, 1.0 m above river bed
f1 - S4/832, 1.0 m above river bed
g1 - MMB527/642, 0.94 m above river bed
h1 - S4/040, 1.0 m above river bed
i1 - MMB527/332, 0.94 m above river bed

II-26. Plan view of the Clarks Ferry site on the Mississippi River for trip 2



II-27. Cross section of the Mississippi River at the Clarks Ferrry site for trip 2

APPENDIX III.

BED MATERIAL CHARACTERISTICS AND LOCATION OF BED MATERIAL SAMPLING AT ALL STUDY SITES

McEver's Island Site

Location		Dist. (ft)	d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
			Characteristics of Bed Material Particle Size (mm)							
6/15/89										
RM49.5	B3*	165	0.19	0.23	0.31	0.34	0.45	0.60	1.40	1.79
REW-LEW	C3	155	0.22	0.24	0.32	0.35	0.42	0.52	1.32	1.59
	D3	135	0.25	0.27	0.36	0.4	0.51	0.75	1.38	1.60
	E3	120	0.19	0.20	0.30	0.34	0.55	2.0	1.67	1.79
	F3	105	0.21	0.23	0.27	0.3	0.4	0.50	1.33	1.43
	J3	35	-	-	0.02	0.028	-	-	-	-
	K3	20	-	-	0.014	0.02	-	-	-	-
6/15/89	A4	40	-	-	0.021	0.03	-	-	-	-
RM50.1	B4	55	-	-	0.19	0.28	0.45	0.6	-	-
LEW-REW	C4	70	0.013	0.026	0.23	0.26	0.35	0.5	5.18	20
	D4	105	0.28	0.31	0.472	0.46	0.58	0.75	1.37	1.64
	E4	125	0.27	0.3	0.4	0.44	0.57	0.75	1.38	1.63
	F4	140	0.3	0.34	0.5	0.56	1.1	3	1.84	1.87
	G4*	155	0.25	0.27	0.49	0.59	1.5	3	2.44	2.36
	I4	185	0.21	0.22	0.28	0.31	0.41	0.5	1.37	1.48
	K4	215	-	0.007	0.15	0.2	0.29	0.35	11.68	-
	L4	240	-	-	0.03	-	-	-	-	-
	M4	260	-	0.008	0.06	0.1	0.2	0.25	5.42	-
	N4	280	-	0.004	0.049	0.075	0.17	0.25	7.86	-
6/15/89	A5	230	-	0.002	-	-	-	-	-	-
RM50.5	B5	215	-	0.006	0.2	0.26	0.39	0.5	17.64	-
REW-LEW	C5	200	0.25	0.25	0.36	0.4	0.59	0.8	1.54	1.6
	D5*	185	0.20	0.26	0.40	0.45	0.65	1.0	1.7	2.25
	E5	170	0.24	0.26	0.35	0.37	0.49	0.65	1.37	1.54
	F5	165	-	-	0.08	0.17	0.28	0.35	-	-
	G5	140	0.002	0.01	0.11	0.13	0.18	0.25	6.32	65

Note: * contained shells that cannot be separated
REW: Right edge of water
LEW: Left edge of water
Both REW and LEW are defined as we look downstream the river.

$$\sigma = \frac{1}{2}\left[\frac{d_{85}}{d_{50}} + \frac{d_{50}}{d_{16}}\right]$$

$$U = \frac{d_{60}}{d_{10}}$$

Preceding Page Blank

Kampsville Site, Trip 1

Location		*Dist. (ft)*	*Characteristics of Bed Material Particle Size (mm)*							
			d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
10/15/90	A1	349	-	-	0.024	0.031	-	-	-	-
RM 35.2	A3	310		0.0023	-	-	-	-	-	-
K13	A4	290	-	-	0.014	0.018	0.032	-	-	-
LEW-REW	A5	271	-	-	0.08	0.013	0.029	-	-	
	A6	254	-	-	0.012	0.019	-	-		
	A7*	233	0.19	0.20	0.30	0.34	0.45	0.60	1.50	1.79
	A8*	213	0.20	0.23	0.34	0.37	0.49	0.65	1.46	1.85
	A9*	193	0.20	0.24	0.35	0.39	0.59	2	1.57	1.95
	A11	148	-	-	0.24	0.27	0.42	0.60	-	-
10/15/90	A12	133	-	0.006	0.18	0.22	0.35	0.6	2.77	-
RM 35.1	A13	112	-	0.052	0.17	0.22	0.45	1	2.96	-
LEW-REW	A14	93	0.006	0.018	0.23	0.28	0.55	2	7.58	46.67
	A15	70	-	-	0.032	0.095	0.35	0.6	-	-
	A16	50	-	0.0042	0.07	0.18	0.34	0.5	10.76	-
	A17	30	-	0.004	0.15	0.2	0.35	0.45	19.92	-
10/10/90	B1	374.5	-	-	0.017	0.022	-	-	-	-
RM 35.2	B2	354.3	-	-	0.014	0.023	-	-	-	-
LEW-REW	B3	330.0	-	-	0.018	0.024	-	-	-	-
	B4	311.0	-	-	0.011	0.017	-	-	-	-
	B5	293.0	0.0022	0.012	0.2	0.24	0.35	0.45		109.09
	B6*	274.0	0.19	0.22	0.29	0.32	0.41	0.48	1.37	1.68
	B7*	255.0	0.19	0.22	0.32	0.35	0.46	0.65	1.45	1.84
	B8*	232.0	0.19	0.22	0.32	0.35	0.48	0.70	1.48	1.84
	B9*	212.0	0.18	0.19	0.27	0.30	0.4	0.5	1.45	1.67
	B10*	191.0	0.13	0.19	0.35	0.45	10.4	-	15.78	3.46
	B11	171.0	-	0.006	0.19	0.21	0.35	0.55	16.75	-
	B12	152.0	-	0.024	-	-	-	-		-
	B14	112.0	-	-	0.019	0.026	-	-		-
	B15	91	-	-	0.013	0.018	-	-		-
10/18/90	C2	300	-	-	-	-	-	-		-
RM 35.2	C4	259	-	-	0.016	0.019	-	-		-
LEW-REW	C6	217	0.002	0.013	0.22	0.25	0.35	0.45		-
	C8*	178	0.20	0.23	0.33	0.36	0.49	0.7	1.46	1.80
	C12	99	-	-	0.018	0.029	-	-		
	C14	57	-	-	0.0055	0.01	-	-		

Note: * contained shells that cannot be separated

Kampsville Site, Trip 2

Location		*Dist. (ft)*	*Characteristics of Bed Material Particle Size (mm)*							
			d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
8/8/91	A	50	-	-	0.032	-	-	-	-	-
RM 35.4	B	100	-	-	0.018	0.027	-	-		-
REW-LEW	C	260	-	0.005	0.18	0.24	0.35	0.7	18.97	-
	D	355	-	-	0.025	-	-	-	-	-
	E	460	-	-	0.115	0.19	0.29	0.45	-	-
	F	540	0.21	0.23	0.35	0.39	0.5	0.65	1.475	-
	G	652	0.2	0.22	0.3	0.34	0.45	0.5	1.432	-
	H	752	-	-	0.01	0.017	0.026	-	-	-
	I	847	-	-	0.0023	0.0046	0.015	0.025	-	-
	J	952	-	-	0.011	0.018	-	-	-	-

Apple River Island Site

Location		*Dist. (ft)*	*Characteristics of Bed Material Particle Size (mm)*							
			d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
5/22/90	A	338	0.28	0.31	0.37	0.39	0.54	0.7	1.33	1.39
RM 546.3	B	312	0.35	0.36	0.58	0.69	1.5	2.5	2.10	1.97
REW-LEW	C	295	0.38	0.41	0.55	0.62	1.16	2.5	1.73	1.63
	D	275	0.35	0.39	0.51	0.55	0.85	1.4	1.49	1.57
	E	251	0.35	0.39	0.51	0.55	0.85	1.4	1.49	1.57
	F	240	0.29	0.33	0.41	0.45	0.54	0.8	1.28	1.55
	G	216	0.3	0.35	0.48	0.5	0.65	1	1.36	1.67
	H	200	0.34	0.37	0.49	0.5	0.62	0.9	1.29	1.47
	I	170	0.28	0.34	0.5	0.58	0.97	1.7	1.71	2.07
	J	141	0.29	0.35	0.52	0.61	0.99	1.9	1.63	2.10
	K	120	0.29	0.34	0.44	0.5	0.85	3	1.61	1.72
	L	62	0.26	0.29	0.39	0.4	0.54	0.65	1.36	1.54
	M	30	0.25	0.27	0.37	0.39	0.49	.6	1.35	1.56
5/23/96	A	338	0.46	0.52	0.74	0.85	1.60	3.00	1.79	1.85
RM 546.4	B	312	0.40	0.44	0.50	0.53	0.71	0.95	1.28	1.33
REW-LEW	C	295	**small sample - just 25 grams total dry weight**							
	D	275	0.30	0.34	0.49	0.55	0.76	1.40	1.50	1.83
	E	251	0.38	0.42	0.56	0.62	0.95	1.70	151	1.63
	F	240	0.28	0.30	0.42	0.45	0.60	0.90	1.41	1.61
	G	216	0.28	0.30	0.39	0.42	0.51	0.63	1.30	1.50
	H	200	0.27	0.29	0.41	0.46	0.80	1.90	1.68	1.70
	I	170	0.28	0.32	0.48	0.51	0.83	1.50	1.61	1.82
	J	141	0.28	0.31	0.48	0.54	0.90	1.80	1.71	1.93
	K*	120	0.27	0.30	0.55	0.69	3.00	6.50	3.64	2.56
	L*	62	0.23	0.26	0.38	0.41	0.58	0.90	1.49	1.78
	M*	30	0.19	0.22	0.28	0.30	0.35	0.40	1.26	1.58
	N*	0	0.19	0.22	0.35	0.40	0.65	8.00	1.72	2.11

Note: * contained shells that cannot be separated

Apple River Island Site (Concluded)

			Characteristics of Bed Material Particle Size (mm)							
Location		*Dist. (ft)*	d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
5/23/90	A	304	0.39	0.4	0.55	0.6	1.14	1	1.32	1.54
RM 546.7	C	255	0.28	0.33	0.5	0.59	1.47	2.3	1.86	2.11
REW-LEW	D	242	0.32	0.39	0.64	0.72	0.78	2.5	1.97	2.25
	E	197	0.24	0.28	0.48	0.52	0.65	1.6	1.67	2.17
	F	150	0.29	0.28	0.45	0.49	1.3	0.9	1.53	1.88
	G	120	0.28	0.33	0.55	0.65	0.9	2	2.02	2.32
	H	90	0.29	0.34	0.54	0.55	0.6	1.5	1.63	1.90
	I	60	0.24	0.27	0.37	0.41	5	09	1.50	1.71
	J*	129	0.15	0.17	0.34	0.41		8	8.35	2.73

Note: *contained shells that cannot be separated.

Goose Island Site, Trip 1

			Characteristics of Bed Material Particle Size (mm)							
Location		*Dist. (m)*	d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
8/29/90	A5		0.41	0.45	0.65	0.7	0.95	1.4	1.45	1.71
RM 319.3	A6		0.32	0.35	0.49	0.5	0.75	1.4	1.47	1.56
GI12	A7		0.3	0.35	0.5	0.54	0.78	1.2	1.49	1.80
	A8		0.28	0.3	0.38	0.4	0.54	0.7	1.34	1.43
	A9		0.27	0.31	0.41	0.46	0.72	1.7	1.54	1.70
	A10		0.29	0.34	0.51	0.6	1.1	2	1.83	2.07
	A11		0.2	0.22	0.29	0.34	0.54	0.8	1.59	1.70
	A12		0.29	0.39	0.69	0.72	0.99	1.5	1.60	2.48
8/29/90	B5	282	0.24	0.27	0.4	0.44	0.6	0.8	1.49	1.83
RM 319.3	B6	263	0.35	0.39	0.59	0.65	0.93	1.5	1.54	1.86
LEW-REW	B7	224	0.28	0.3	0.45	0.5	0.7	1	1.53	1.79
	B8	200	0.26	0.28	0.4	0.44	0.6	0.7	1.46	1.69
	B9	164	0.23	0.26	0.42	0.48	0.7	1.4	1.64	2.09
	B10	123	0.26	0.28	0.43	0.48	0.67	0.9	1.55	1.85
	B11	94	0.19	0.22	0.28	0.3	0.37	0.5	1.30	1.58
	B12	57	0.3	0.36	0.54	0.59	0.74	0.91	1.44	1.97
	B13	30	0.39	0.45	0.65	0.7	0.95	1.5	1.45	1.79
8/29/90	04	359	0.55	0.66	1.24	1.47	2.3	3.5	1.87	2.67
G12-TRC	05	335	0.46	0.54	0.88	1	1.7	2.2	1.78	2.17
LEW-REW	06	297	0.39	0.44	0.63	0.69	0.95	1.6	1.47	1.77
	07	271	0.35	0.4	0.5	0.51	0.64	0.79	1.27	1.46
	08	232	0.29	0.34	0.48	0.49	0.6	0.82	1.33	1.69
	09	200	0.27	0.32	0.47	0.5	0.7	1.1	1.48	1.85

Goose Island Site, Trip 1 (Concluded)

Location		Dist. (m)	d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
			Characteristics of Bed Material Particle Size (mm)							
G12-TRC	10	164	0.31	0.35	0.5	0.55	0.85	1.3	1.56	1.77
REW-LEW	11	140	0.3	0.34	0.48	0.5	0.65	0.85	1.38	1.67
	12	105	0.29	0.32	0.48	0.52	0.72	1	1.50	1.79
	13	78	0.27	0.31	0.48	0.51	0.75	1.1	1.56	1.89
	14	46	0.24	0.27	0.38	0.41	0.59	0.8	1.48	1.71
	15	17	0.16	0.17	0.19	0.21	0.29	0.37	1.32	1.31

Goose Island Site, Trip 2

Location		Dist. (ft)	d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
			Characteristics of Bed Material Particle Size (mm)							
7/20/91	820	820	0.27	0.31	0.45	0.48	0.62	0.94	1.42	1.78
RM 319.5	702	702	0.34	0.41	0.66	0.75	1.2	1.82	1.71	2.21
TR2	645	645	0.28	0.31	0.44	0.48	0.65	0.95	1.45	1.71
REW-LEW	580	580	0.28	0.31	0.4	0.45	0.65	0.9	1.46	1.61
	520	520	0.3	0.35	0.49	0.54	0.8	1.2	1.52	1.8
	464	464	0.27	0.31	0.54	0.63	1.00	1.70	1.8	2.33
	398	398	0.26	0.28	0.42	0.49	0.90	2.40	1.82	1.88
	340	340	0.28	0.30	0.36	0.39	0.55	0.81	1.36	1.39
	277	277	0.24	.26	0.37	0.39	0.59	1	1.51	1.63
	217	217	0.22	0.25	0.36	0.39	0.55	0.7	1.48	1.77
	160	160	0.21	0.23	0.35	0.37	0.46	0.59	1.42	1.76
	100	100	0.19	0.21	0.25	0.26	0.34	0.4	1.28	1.37
7/21/91	887	904	0.24	0.26	0.38	0.41	0.59	0.8	1.51	1.71
RM 319.8	830	847	0.24	0.26	0.44	0.49	0.7	0.95	1.64	2.04
GISC	768	785	0.26	0.31	0.70	0.83	1.5	2	2.2	3.19
REW-LEW	710	724	0.28	0.31	0.48	0.51	0.71	1	1.51	1.82
	651	668	0.28	0.34	0.5	0.54	0.74	1	1.48	1.93
	591	605	0.34	0.39	0.55	0.59	0.83	1.22	1.46	1.74
	529	546	0.27	0.31	0.46	0.49	0.6	0.75	1.39	1.82
	467	484	0.35	0.39	0.49	0.51	0.61	0.81	1.25	1.46
	407	424	0.326	0.36	0.49	0.5	0.65	0.87	1.37	1.53
	349	366	0.31	0.36	0.49	0.51	0.66	0.9	1.35	1.65
	290	307	0.29	0.34	0.46	0.49	0.61	0.9	1.34	1.69
	231	248	0.27	0.31	0.41	0.45	0.7	2	1.52	1.67
	165	182	0.29	0.33	0.48	0.51	0.7	1	1.46	1.76
	110	129	0.29	0.31	0.45	0.49	0.58	0.8	1.37	1.69
	50	69	0.21	0.24	0.35	0.38	0.5	0.65	1.44	1.81
	20	34	0.15	0.18	0.26	0.32	0.50	0.68	1.68	2.13
	?		0.19	0.21	0.30	0.35	0.51	0.8	1.56	1.84

Clarks Ferry Site, Trip 1

Location		*Dist. (m)*	*Characteristics of Bed Material Particle Size (mm)*							
			d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
5/23/91	A	642	-	0.005	0.15	0.2	0.32	0.45	16.1	-
RM 468.3	B	604	0.28	0.35	0.52	0.57	0.75	0.95	1.46	2.04
XS3	C	554	0.22	0.24	0.35	0.38	0.55	0.8	1.51	1.73
LEW-REW	D	497	0.21	0.24	0.37	0.4	0.75	1.5	1.78	1.90
	E	444	0.22	0.24	0.32	0.36	0.51	0.8	1.46	1.64
	F	408	0.23	0.24	0.35	0.36	0.45	0.57	1.37	1.57
	G	343	0.28	0.31	0.41	0.47	0.65	0.81	1.45	1.68
	H	298	0.25	0.29	0.36	0.39	0.5	0.61	1.32	1.56
	I	248	0.28	0.31	0.47	0.5	0.75	1.2	1.56	1.79
	J	192	0.29	0.32	0.43	0.49	0.8	1.4	1.60	1.69
5/22/91	A	615	0.002	0.017	0.22	0.27	0.4	0.5	7.38	
RM 468.1	B	575	0.28	0.31	0.45	0.49	0.59	0.71	1.38	1.75
XS1	C	520	0.22	0.24	0.38	0.41	0.6	0.8	1.58	1.86
LEW-REW	D	475	0.23	0.25	0.38	0.39	0.55	0.8	1.48	1.70
	E	422	0.24	0.27	0.39	0.44	0.65	1.1	1.56	1.83
	F	370	0.23	0.25	0.35	0.38	0.55	0.7	1.49	1.65
	H	269	0.28	0.31	0.42	0.46	0.6	0.8	1.39	1.64
	I	235	0.28	0.31	0.4	0.44	0.59	0.8	1.38	1.57
	J	178	0.34	0.37	0.6	0.7	1.4	2	1.98	2.06
	K	125	0.29	0.34	0.44	0.48	0.79	1.23	1.54	1.66
5/14/91	01	15	-	-	0.028	-	-	-	-	-
RM 468.2	05	138	0.28	0.31	0.46	0.49	0.75	2	1.56	1.75
MRX2	06	172	0.28	0.31	0.41	0.44	0.65	0.9	1.45	1.57
REW-LEW	07	193	0.27	0.29	0.38	0.39	0.5	0.69	1.31	1.44
	08	230	0.27	0.31	0.39	0.41	0.65	1.2	1.46	1.52
	09	260	0.27	0.3	0.39	0.45	0.7	1.1	1.55	1.67
	10	295	0.27	0.3	0.39	0.4	0.55	0.7	1.36	1.48
	11	305	0.28	0.3	0.38	0.4	0.55	0.66	1.36	1.43
	12	340	0.28	0.32	0.45	0.49	0.55	0.7	1.31	1.75
	13	361	0.25	0.29	0.4	0.45	0.6	0.8	1.44	1.80
	14	395	0.22	0.24	0.34	0.36	0.5	0.67	1.44	1.64
	15	427	0.23	0.24	0.36	0.39	0.55	0.9	1.51	1.70
	16	454	0.23	0.26	0.38	0.39	0.55	0.8	1.45	1.70
	17	487	0.23	0.25	0.36	0.39	0.55	0.7	1.48	1.70
	18	502	0.22	0.24	0.32	0.36	0.59	0.9	1.59	1.64
	19	531	0.19	0.22	0.28	0.31	0.42	0.51	1.39	1.63
	20	565	0.006	0.02	0.24	0.29	0.52	0.7	7.08	48.33
	21	598	0.21	0.23	0.29	0.32	0.48	0.7	1.46	1.52
	22	620	-	-	0.018	0.024	-	-	-	-

Clarks Ferry Site, Trip 2

Location		*Dist. (ft)*	*Characteristics of Bed Material Particle Size (mm)*							
			d_{10}	d_{16}	d_{50}	d_{60}	d_{85}	d_{95}	σ	U
10/19/91	A	2015	0.13	0.16	0.25	0.28	0.44	0.60	1.66	2.15
RM 468.3	B	1921	0.23	0.26	0.37	0.39	0.5	0.65	1.39	1.70
XSB	C	1824	0.24	0.26	0.42	0.48	0.63	0.8	1.56	2.00
LEW-REW	D	1727	0.23	0.25	0.36	0.4	0.55	0.75	1.48	1.74
	E	1627	0.22	0.24	0.35	0.36	0.5	0.7	1.44	1.64
	F	1524	0.23	0.25	0.37	0.41	0.6	0.85	1.55	1.78
	G	1424	0.19	0.22	0.38	0.41	0.61	1	1.67	2.16
	H	1322	0.21	0.22	0.28	0.31	0.45	0.59	1.44	1.48
	J	1128	0.29	0.33	0.48	0.5	0.63	0.8	1.38	1.72
	K	1023	0.23	0.25	0.4	0.44	0.65	0.85	1.61	1.91
	L	925	0.25	0.28	0.42	0.46	0.65	0.82	1.52	1.84
	M	829	0.25	0.27	0.38	0.41	0.6	1	1.49	1.64
	N	724	0.26	0.3	0.42	0.49	0.9	2.5	1.77	1.88

APPENDIX IV.

AMBIENT WATER LEVELS AND AIR AND WATER TEMPERATURES AT ALL STUDY SITES

McEver's Island Site
(NA)

Kamspville Site, Trip 1

Date	Time	Temperature: Air (°F)	Temperature: Surface water (°C)	Temperature: Under water measured by S4/040 (°C)	Temperature: Under water measured by S4/071 (°C)	Water surface stage* (ft)
10/11/90	09:00					2.20
	10:00					2.24
	13:46					2.40
	17:47					2.54
10/12/90	09:45					2.78
	12:39					2.98
	13:35			14.6	14.5	
	13:49			14.6	14.5	
	14:28		18.0			3.10
	15:30	67.1	17.0			3.14
	17:00	59.0	17.0			3.24
10/13/90	09:32				13.5	
	09:45	58.1	15.5			3.46
	09:56				13.4	
	10:00				13.4	
	10:53	61.7	16.0			3.50
	11:09			13.4	13.4	
	11:58	64.4	16.0			3.48
	13:42	66.2	17.0			3.48
	15:22			13.5	13.6	
	15:33	68.9	16.0			3.50
	16:25			13.5	13.6	
	17:12	65.3				3.46
10/14/90	07:20	51.8	14.0			3.54
	09:30	60.8	15.0			3.56
	10:18				12.4	
	10:35	61.7	15.5			3.60
	10:57			12.3		
	11:43				12.4	
	12:26			12.4	12.4	
	12:51	73.4	16.0			3.58
	13:30			12.5	12.6	
	15:02	71.6	16.0			3.60
	15:30			12.6	12.7	
	15:45	67.1	16.0			

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Kamspville Site, Trip 1 (Concluded)

Date	Time	Temperature: Air (°F)	Surface water (°C)	Under water measured by S4/040 (°C)	Under water measured by S4/071 (°C)	Water surface stage* (ft)
	15:59			12.6	12.7	
	16:07	66.2	16.0			3.52
	16:38			12.6	12.7	
	17:31		16.0			3.54
10/15/90	09:50			12.9	13.0	
	09:53		15.0			3.66
	10:33	60.0	15.0			3.64
	10:50	58.0	16.0			3.66
	12:08			13.3	13.2	
	13:25	58.5	16.0			3.68
	14:41					3.64
	14:52			13.6		
	15:12			13.7	13.7	
	16:02	67.0	16.0			3.68
	17:30	64.0	15.0			3.68
10/16/90	09:22	59.0	15.5			3.72
	10:28			14.1	14.1	
	10:49	63.0	16.0			3.72
	11:56	66.0	17.0			3.74
	12:48	67.0	17.0			3.76
	14:44	74.5	17.0			3.76
	15:46	75.0	18.0			3.80
	16:21			14.6	14.7	
	16:56	73.0	18.0			3.80
	18:00	76.0	18.0			3.84
10/17/90	09:15	73.5	17.5			3.90
	10:26			14.8	14.8	
	11:14			14.8	14.8	
	11:28	73.5	17.5			3.90
	14:06	73.5	18.0			3.92

*water stage data were taken from a staff gage installed by ISWS for these field trips

Kampsville Site, Trip 2

Date	Time	Temperature: Air (°F)	Temperature: Surface water (°C)	Water surface stage* (ft)
8/12/91	06:20			1.90
8/13/91	09:00			2.00
	11:40			2.00
	12:10	84.0	22.2	2.00
	18:40			1.94
8/14/91	07:00			2.12
8/15/91	17:00			1.94
	18:40			1.92

*water stage data were taken from a staff gage installed by ISWS for these field trips

Apple River Island Site

		Temperature				Water
			Water	Water in channel		Surface
Date	Time	Air (°C)	near shore (°C)	S4/040 (°C)	S4/071 (°C)	stage (m)
5/18/90	14:34	20.5				
5/19/90	9:55				15.3	
	11:20				15.2	
	11:40				15.1	
	11:56				15.1	
	14:34	18.0	16.1			0.30
5/20/90	7:54	12.0	15.0			0.27
	10:55	11.0	15.0			0.29
	11:27			14.9		
	12:08	12.0	15.3			0.30
	12:36			14.8		
	15:33			14.6	14.9	
	17:56	11.5	15.0			0.33
5/21/90	8:26	10.5	13.9			0.35
	10:06			13.5	13.8	
	10:20					
	11:00			13.5	13.8	

Apple River Island Site (Concluded)

Date	Time	Temperature: Air (°C)	Temperature: Water near shore (°C)	Temperature: Water in channel S4/040 (°C)	Temperature: Water in channel S4/071 (°C)	Water Surface stage (m)
	11:10	13.0	14.4			
	12:40	15.0	14.4			0.35
	14:19			13.6		
	14:37			13.6	13.8	
	14:55			13.6	13.8	
	15:30	15.0	14.4			0.37
	16:50	16.0	14.7			0.38
5/22/90	9:10	12.0	13.9			0.43
	10:09			13.6	13.8	
	11:00	15.0	15.3			0.43
	13:40	18.0	15.6			0.44
	15:01	20.5	15.6			0.45
	16:30	20.0	15.6			0.45
	17:08			14.3	14.5	
	17:28			14.4	14.6	
	18:06			14.4	14.6	
	19:49			14.6	14.8	
5/23/90	6:40	12.0	15.0			0.47
	6:52			14.0		
	8:45	14.0	15.0			0.48
	10:05	15.0	15.0			0.48
	13:05	16.5	15.0			0.49
	14:09	17.0	15.3			0.50
	15:05	17.0	15.3			0.51
	16:13			14.4		
	18:00	17.0	15.0			0.52
5/24/90	7:28					0.57
	8:35					0.57

Goose Island Site, Trip 1

Date	Time	Temperature: Air (°C)	Temperature: Water near shore (°C)	Temperature: Water in channel S4/040 (°C)	Temperature: Water in channel S4/071 (°C)	Water Surface stage (m)
8/24/90	9:19	26.0	26.0			0.26
	10:16	28.0	26.0			0.24
	10:51			25.6	25.7	
	11:05	28.5	26.0			0.24
	12:08	29.5	26.0			0.21
	13:19	31.0	26.5			0.21
	13:42			25.6	25.8	
	13:54			25.6	25.9	
	14:16			25.7	25.9	
	14:33	31.0	26.5			0.21
	15:13	31.5	26.8			0.20
	16:19	31.5	27.0			0.19
	16:25	31.5	27.0			0.19
	16:39				26.1	
	18:07	31.0	27.0			
	18:55	30.0	26.0			0.18
8/25/90	7:25	25.0	25.0			0.19
	9:30	27.0	25.5			0.20
	10:35	27.5	26.0			0.20
	11:19			25.8	26.0	
	11:44	28.0	26.0			0.20
	12:15			25.8	27.0	
	12:24			25.8	26.0	
	12:31	29.0	27.0			
	13:51	29.5	27.0			0.19
	14:16	29.5	27.0			0.19
	15:06	30.5	27.0			0.20
	15:45			26.0	26.2	
	16:00	30.5	27.0			0.20
8/26/90	9:08		26.0			
	9:52	29.0	26.0			0.19
	11:00	30.5	26.5			0.19
	11:46			25.8	26.1	
	12:56	32.0	27.0			0.18
	13:27			25.9	26.1	

Goose Island Site, Trip 1 (Concluded)

Date	*Time*	*Temperature* Air (°C)	Water near shore (°C)	Water in channel S4/040 (°C)	Water in channel S4/071 (°C)	*Water Surface stage (m)*
	14:13	33.0	28.0			0.20
	14:21			26.0		
	15:29	34.0	28.0			0.20
8/27/90	9:00		26.0			0.36
	9:37	30.0	26.0			0.36
	10:12	31.0	26.5			0.36
	11:50	33.0	27.0			0.39
	13:31	35.5	27.0			0.41
	18:05	35.0	27.0			0.43

Goose Island Site, Trip 2

Date	*Time*	*Temperature* Air (°C)	Water near shore (°C)	Water in channel S4/40 (°C)	Water in channel S4/151 (°C)	Water in channel S4/834 (°C)	Water in channel S4/832 (°C)	Water in channel S4/071 (°C)	*Water surface stage (m)*
7/16/91	15:30								0.55
	16:30								0.55
	17:00								0.55
7/17/91	12:30								0.55
	15:00	33.3							0.52
	16:50	35.0							0.52
7/18/91	7:45	27.8							0.49
	9:00								0.49
	10:42				27.4	27.7	27.3		
	12:26					27.8	27.5		
	11:00	29.4	29.0						0.49
	12:36	31.7	29.0						0.49
	13:54	32.2	29.0						0.49
	14:17			28.0	27.6	27.9	28.0	28.3	
	15:07	32.8	30.0						0.48
	16:16	32.8	30.0						0.48

Goose Island Site, Trip 2 (Continued)

			Temperature							Water surface stage
			Water near shore	Water in channel						
		Air		S4/40	S4/151	S4/834	S4/832	S4/071		
Date	Time	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)		(m)
	17:23			28.3	27.9	28.2				
	18:07									
7/19/91	9:20	27.8	29.0							0.42
	10:17	28.9	29.0							0.41
	11:03					27.9				
	11:20	30.0	29.0							0.40
	13:08	31.9	29.0							0.39
	16:00	33.3	29.5							0.34
	16:24					28.4		28.6		
	16:33					28.3		28.6		
	17:50	32.5	29.0							0.30
	18:05					28.4				
7/20/91	6:15	25.6	29.0							0.30
	7:55	25.8	29.0							0.32
	8:09				27.8	28.1				
	8:19				27.8	28.1				
	9:06	27.8	29.0							0.33
	10:41	29.4	29.0							0.34
	11:39				27.9	27.6	27.8			
	11:55				27.9	27.6	27.8			
	13:00	31.7	31.0							0.35
	13:31				27.9	27.6	27.8			
	16:24	32.8	31.0							0.35
	16:56				28.3	28.0	28.2			
7/21/91	9:30	30.6								0.30
	12:51	32.8	32.0							0.25
	13:08			28.7	28.3	28.2	28.1	28.9		
	14:21	32.5								0.22
	14:57			28.9	28.4	28.2	28.3	29.1		
	15:11	32.5								0.18
	16:22	33.6								0.77
	17:33	34.4								0.76
7/22/91	8:00	28.9	29.0							0.79
	10:12	31.1	30.0							0.79

Goose Island Site, Trip 2 (Continued)

		Temperature							Water surface stage
			Water near shore	Water in channel					
		Air		S4/40	S4/151	S4/834	S4/832	S4/071	
Date	*Time*	*(°C)*	*(°C)*	*(°C)*	*(°C)*	*(°C)*	*(°C)*	*(°C)*	*(m)*
	10:34			28.8	28.4	28.1	28.3		
	12:00	32.8	32.0						0.80
	12:11			28.9	28.5	28.2	28.3	29.1	
	13:00	33.9	32.0						0.80
	13:16			29.0	28.6	28.3	28.5	29.2	
	13:20			29.1	28.6	28.3	28.5	29.2	
	13:24			29.1	28.6	28.3	28.5	29.2	
	14:00			29.1	28.6	28.3	28.5	29.3	
	14:10	34.4	32.0						0.79
	15:00	35.0	32.0						0.77
	17:10	34.4	32.0						0.76
7/23/91	9:45	25.6	30.0						0.66
	10:57	27.2	30.0						0.67
	12:00								0.73
	13:15								0.76
	14:00	27.8	30.0						0.76
	14:12			29.1	28.8	28.5	28.6	29.4	
	14:20			29.2	28.7	28.5	28.6	29.4	
	15:15	28.9	30.0						0.79
	15:55			29.2	28.8	28.6	28.7	29.5	
	15:59			29.2	28.9	28.6	28.7	29.5	
	16:18	28.9	31.0						0.84
	16:24			29.2	28.8	28.5	28.7		
	17:15	28.9	31.0						0.85
7/24/91	7:00								0.87
	8:12	18.9							0.86
	8:25			28.7	28.3	28.0	28.1		
	9:14			28.7	28.2		28.1		
	9:58			28.7	28.2		28.1	28.9	
	10:22	21.1							0.85
	10:45								0.82
	10:55								0.82
	11:47								0.79
	12:13			28.6	28.2		28.1	28.8	
	12:29								0.79
	13:44			28.6	28.2		28.1	28.8	

Goose Island Site, Trip 2 (Concluded)

		Temperature							Water surface stage
			Water near shore	Water in channel					
		Air		S4/40	S4/151	S4/834	S4/832	S4/071	
Date	Time	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(m)
	13:57								0.79
	14:48			28.6	28.2		28.1	28.8	
	15:43			28.6	28.2		28.1	28.8	

Clarks Ferry Site, Trip 1

		Temperature							Water surface stage*
			Surface water	Under water measured by					
		Air		S4/151	S4/834	S4/832	S4/483	S4/071	
Date	Time	(°F)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(ft)
5/16/91	10:39								2.32
	11:59								2.32
	12:08			20.9		20.1			
	12:23			21.3		20.1			2.36
	12:59								
	13:27			20.4		20.2			
	13:59								2.38
	14:53								2.38
	16:51								2:40
5/17/91	10:00								2:48
	11:06								2:48
	11:58								2:48
	12:26			21.0	20.4	20.7	21.0	21.1	
	13:04	79.5	25.0						
	15:04			21.3	20.8	21.1	21.4	21.5	
	15:35	81.0							2.50
	16:32		21.5	20.9	21.3	21.5	21.6		
	17:45		21.4	20.9	21.3	21.5	21.6		
5/18/91	11:03	52.5							3.00
	12:17	52.5	19.0						3.02
	13:17	53.0	19.0						3.02
	14:50	55.0	19.5						3.04
	16:16	55.0	19.5						3.08

Clarks Ferry Site, Trip 1 (Continued)

		Temperature							*Water surface stage**
			Surface water	*Under water measured by*					
Date	*Time*	*Air (°F)*	*(°C)*	*S4/151 (°C)*	*S4/834 (°C)*	*S4/832 (°C)*	*S4/483 (°C)*	*S4/071 (°C)*	*(ft)*
5/19/91	08:25	55.0	19.0						
	10:07			17.9	17.3	17.8	18.4		
	10:30	61.0	20.5						2.98
	11:42			18.0	17.4	17.8	18.4	18.5	
	11:45	64.0	21.0						2.98
	12:53	66.0	21.0						2.98
	14:21	68.0	22.0						2.98
	15:14	69.0	22.0						3.02
	16:29								3.04
	16:34			18.3	17.7	18.1	18.7	18.8	
	17:08	68.0	21.0						3.06
5/20/91	09:10	61.0	19.0						3.10
	10:57	67.0	21.0						3.10
	11:35			17.5	17.0	17.4	17.9	18.0	
	12:20	69.0	21.0						3.10
	12:24			17.6	17.0	17.5	18.0	18.1	
	13:00	70.5	22.0						3.12
	14:06	73.5	22.0						3.14
	15:15	75.0	22.5						3.16
	15:49			18.1	17.5	18.0	18.7	18.7	
	16:00	76.0	22.0						3.16
5/21/91	09:10			18.3	16.9	18.1	18.4	18.5	
	09:37				16.9	18.1	18.4		
	09:42	74.5	21.0						3.25
	10:30				16.9	18.2	18.6		
	10:46	75.0	21.0						3.25
	10:49				16.9	18.2	18.6		
	11:33					18.3	18.7		
	11:49	75.0	21.0						3.25
	12:13					18.4	18.8		
	12:38					18.4	18.8		
	12:45	76.0	21.5						3.25
	13:31					18.6	19.0		
	14:04	76.0	22.0						3.28
	15:01	77.0	22.0						3.28
	16:09				19.0	19.0	19.5	19.6	
	16:25	78.0	22.0						3.28

Clarks Ferry Site, Trip 1 (Concluded)

		Temperature							Water surface stage*
				Under water measured by					
Date	Time	Air (°F)	Surface water (°C)	S4/151 (°C)	S4/834 (°C)	S4/832 (°C)	S4/483 (°C)	S4/071 (°C)	(ft)
5/22/91	08:28	74.0							3.28
	09:49	76.0							
	09:54				18.0	18.9	19.0	19.0	
	10:30	75.0	22.0						
	10:55				18.1	18.9	19.1	19.1	
	11:33	77.0	23.0						
	12:55	79.0							
	13:47				18.5	19.2	19.4	19.4	
	14:16	80.0	23.0						
	15:03	81.0							
	16:03	82.0	25.0						
	16:58	82.0	24.0						
5/23/91	08:50		22.0						

*water stage data were taken from a staff gage installed by ISWS for these field trips.

Clarks Ferry Site, Trip 2

		Temperature						Water surface stage*
				Under water measured by				
Date	Time	Air (°F)	Surface water (°C)	S4/040 (°C)	S4/834 (°C)	S4/151 (°C)	S4/832 (°C)	(ft)
10/17/91	07:34			12.0				
	07:50		14.0					3.80
	09:21	54.0	18.0					3.78
	11:22	54.0	22.0					3.80
	11:44			11.9	11.9	11.5	11.4	
	11:45			11.9	10.9	11.5	11.4	
	13:22	60.0	25.0					3.80
	17:06				11.6	12.0	11.9	
	18:56			12.7	11.7	12.0	11.9	
	20:14			12.7	11.6	12.0	11.9	
	20:20			12.7	11.6	12.0	11.9	
	20:51			12.7	11.7	11.9	11.8	
10/18/91	07:17			12.1	11.0	11.1	11.0	
	07:30	52.0	5.0					3.75
	07:43			12.1	11.0	11.1	11.0	

Clarks Ferry Site, Trip 2 (Concluded)

		Temperature							Water surface stage*
				Under water measured by					
Date	*Time*	*Air (°F)*	*Surface water (°C)*	*S4/151 (°C)*	*S4/834 (°C)*	*S4/832 (°C)*	*S4/483 (°C)*	*S4/071 (°C)*	*(ft)*
10/18/91	08:26			12.0	10.9	11.1	10.9		
	09:20	52.0	15.0					3.75	
	09:57			10.9	10.7	11.1	10.9		
	10:07			11.8	10.7	11.1	11.0		
	11:21	57.0	20.0					3.75	
	11:27			11.8	10.7				
	12:32			11.8	10.8	11.4	11.2		
	13:18	59.0	20.0					3.80	
	15:30							3.80	
10/19/91	07:00	49.0	0.0					3.78	
	09:00	50.0	7.0					3.78	
	10:15			10.9	9.9	10.6	10.5		
	11:00	52.0	11.0					3.78	
	12:08			10.9	10.0	10.8	11.7		
	12:53	57.0	13.0					3.78	
	12:58			11.0	10.2	11.0	10.8		
	13:45			11.1	10.2	11.0	10.9		
	14:04			11.1	10.3	11.1	10.9		
	14:54			11.3	10.4	11.2	11.0		
	15:01	55.0	11.0					3.80	
	17:04	53.0	11.0					3.84	
	17:31			11.5	10.6	11.2	11.1		
10/20/91	06:55			11.2	10.3	10.7	10.6		
	07:06			11.2	10.3	10.7	10.6		
	07:30	49.0	4.0						3.86
	09:06	50.0	7.0						3.86
	09:33			11.1	10.2	10.7	10.6		
	10:53	52.0	11.0						3.86
	12:20			11.1	10.0	10.9	10.9		

*water stage data were taken from a staff gage installed by ISWS for these field trips.

APPENDIX V.

MEASURED WATER DISCHARGE, COMPUTED AVERAGE VELOCITY, AND WATER DEPTH FOR ALL STUDY SITES

McEver's Island Site

Date	*Qw* *cms*	$\overline{V}$ *m/s*	$\overline{D}$ *m*
5/17/89	212	0.27	3.37

Kampsville Site

Trip 1

Date	*Qw* *cms*	$\overline{V}$ *m/s*	$\overline{D}$ *m*
10/10/90	413	0.36	3.44
10/15/90	772	0.58	3.64
10/18/90	817	0.61	3.91

Trip 2

8/8/91	329	0.29	3.51

Apple River Island Site

Date	*Qw* *cms*	$\overline{V}$ *m/s*	$\overline{D}$ *m*
5/22/90	1537.4	0.81	5.16

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Goose Island Site

Date	Qw cms	$\overline{V}$ m/s	$\overline{D}$ m
Trip 1			
8/29/90	2856	1.13	6.04
Trip 2			
7/20/91	1808	0.83	5.42
7/24/91	1880	0.84	5.56

Clarks Ferry Site

Date	Qw cms	$\overline{V}$ m/s	$\overline{D}$ m
Trip 1			
5/14/91	2351	0.83	4.41
5/22/91	2072	0.78	4.18
5/23/91	2428	0.85	4.36
Trip 2			
10/19/91	673	0.32	3.40

APPENDIX VI.

AMBIENT SUSPENDED SEDIMENT CONCENTRATIONS AT ALL STUDY SITES

McEver's Island Site
(NA)

Kampsville Site, Trip 1

Sampling date	*River mile*	*Station ID*	*Dist. (m) (REW-LEW)*	*Concentration (mg/L)*
10/18/90	35.2	C1/2	300	206.0*
		C3	278	470.0*
		C4	259	357.2*
		C5	243	387.4
		C6	217	347.5*
		C7	198	259.5*
		C8	178	263.6*
		C9	160	339.9
		C10	137	307.7
		C11	124	237.6*
		C12	99	229.7*
		C13	80	372.8*
		C14	57	320.6
		C15	37	329.7
		C16	20	318.0
10/19/90		B13	139	246.8*
		B14	122	259.2
		B15	101	285.3
		B16	82	164.5

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Kampsville Site, Trip 2

Sampling date	*River mile*	*Station ID*	*Dist. (ft) (REW-LEW)*	*Concentration (mg/L)*
8/08/91	35.4	A	50	107.9*
		B	148	158.6
		C	260	132.4
		D	355	84.6
		E	460	88.9
		F	540	122.0
		G	652	128.7
		H	752	78.5
		I	847	73.4
		J	952	171.6

*algae grown in sample bottles; therefore, results were used as a reference value only.

Apple River Island Site
(NA)

Goose Island Site, Trip 1
(NA)

Goose Island Site, Trip 2

Sampling date	*River mile*	*Station ID*	*Dist. (ft) (REW-LEW)*	*Concentration (mg/L)*
07/20/91	319.3	t-40	40	146.4
		t-100	100	130.9
		t-160	160	129.7
		t-217	217	129.8
		t-277	277	137.9
		t-340	340	122.8
		t-398	398	123.4
		t-464	464	119.1
		t-520	520	127.5
		t-580	580	122.1
		t-645	645	115.6
		t-702	702	119.4
		t-757	757	104.1
		t-820	820	121.1
		t-897	897	130.5
		t-942	942	111.0

Goose Island Site, Trip 2 (Continued)

Sampling date	*River mile*	*Station ID*	*Dist. (ft) (REW-LEW)*	*Concentration (mg/L)*
07/20/91	319.3			
		t-1061	1061	117.1
		t-1185	1185	127.6
		t-1240	1240	129.5
		t-1290	1290	147.6
		t-990	990	116.5
		t-1100	1100	116.6
07/21/91	319.8	G-20	37	89.5
		G-50	67	98.6
		G-110	127	80.4
		G-165	182	82.5
		G-231	248	72.1
		G-290	307	74.0
		G-349	366	83.9
		G-407	424	66.7
		G-467	484	67.3
		G-529	546	72.8
		G-591	608	71.1
		G-651	668	94.7
		G-710	727	69.2
		G-768	785	70.7
		G-830	847	75.5
		G-887	904	69.4
		G-946	963	73.4
07/24/91	319.3	t-17	17	113.0
		t-35	35	83.9
		t-55	55	80.2
		t-75	75	69.8
		t-96	96	62.6
		t-115	115	110.7
		t-135	135	99.5
		t-157	157	101.4
		t-175	175	135.9
		t-195	195	78.5

Goose Island Site, Trip 2 (Concluded)

Sampling date	*River mile*	*Station ID*	*Dist. (m) (REW-LEW)*	*Concentration (mg/L)*
07/24/91	319.3	t-215	215	116.6
		t-233	233	115.3
		t-257	257	113.3
		t-274	274	114.7
		t-295	295	116.4
		t-314	314	134.2
		t-333	333	133.9
		t-355	355	143.3
		t-373	373	134.5
		t-391	391	247.8

Clarks Ferry Site, Trip 1

Sampling date	*River mile*	*Station ID*	*Dist. (ft) (LEW-REW)*	*Concentration (mg/L)*
05/23/91	468.1	A1	75.46	118.4
		B1	180.44	130.0
		C1	377.29	126.1
		D1	551.17	121.2
		E1	738.18	115.6
		F1	849.73	120.0
		G1	1020.33	122.1
		H1	1181.09	125.1
		I1	1351.69	126.1
		J1	1525.57	126.5
		K1	1673.21	130.0
		L1	1853.65	128.7
		M1	1985.11	110.5

Clarks Ferry Site, Trip 1 (Concluded)

Sampling date	*River mile*	*Station ID*	*Dist. (ft) (LEW-REW)*	*Concentration (mg/L)*
05/14/91	468.2	1	42.65	136.5
		2	141.08	136.0
		3	239.50	114.1
		4	354.33	118.1
		5	446.19	114.7
		6	557.74	129.1
		7	626.63	113.8
		8	748.02	105.4
		9	846.45	110.9
		10	961.28	106.2
05/14/91		11	994.08	123.2
		12	1108.91	109.5
		13	1177.81	104.2
		14	1289.36	105.5
		15	1394.34	106.3
		16	1482.92	120.9
		17	1591.19	122.5
		18	1640.40	113.0
		19	1735.54	115.8
		20	1847.09	119.1
		21	1955.36	141.9
		22	2027.54	138.4
05/22/91	468.3	A3	124.67	130.4
		B3	239.50	128.6
		C3	446.19	127.0
		D3	580.70	125.5
		E3	764.43	122.0
		F3	928.47	124.3
		G3	1076.10	125.4
		H3	1289.36	131.7
		I3	1407.47	136.3
		J3	1581.35	128.8
		K3	1768.35	124.3
		L3	1932.39	122.5
		M3	2057.06	98.0

APPENDIX VII.

TRAFFIC CHARACTERISTICS AT ALL STUDY SITES

McEver's Island Site

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
5/16/89	R.W. Naye	1020	2	N	22.9	7.3	11	3×3		2.74	2.20	120	u
	Evelyn C.	2200	2	N	25.9	10.7	1	1×1		0.76		130	d
5/17/89	Mary Ellen	800	2	Y	17.7	6.1	6	2×3		2.74	1.22	150	u
	Elaine Jones	5000	2	Y	47.0	12.2	8	2×4		2.74	2.00	120	u
	Bill McCormick	3200	2	Y	45.3	10.5	16	3×5+1		2.74	2.55	130	d
	Nicolas Duncan	1530	2	N	39.0	8.5	15	3×5		2.74	1.39	130	u
5/18/89	Mobil Leader	5000	2	Y	47.0	13.5	6	2×3		2.74	2.40	140	u
	Reliance	5600	2	Y	38.7	12.2	15	3×5		2.08	2.27	130	u
	Cooperative Vanguard	3700	2	N	51.2	12.2	15	3×5		2.74	2.64	160	d
	Marvin E. Norman	1800	2	N	31.1	10.4	15	3×5		0.76	2.59	130	u
	Illini	1600	2	N	24.4	8.5	11	3×4-1		2.74	2.30	160	d
5/19/89	Thurston B. Norton	4200	2	N	45.7	10.7	13	1+3×4		2.74	2.10	150	d
	Clarence G. Frame	4100	2	Y	43.9	10.7	15	3×5		2.74	2.75	160	d

Kampsville Site, Trip 1

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
10/11/90	Mallard	1650	2	N	26.8	9.1	2	1×2	chemical	0.61	3.83	122	d
	Nicolas Duncan	1530	2	N	39.0	8.5	9	3×3	grain	1.32	2.88	155	d
	Bill Gee	2800	2	Y	36.9	10.1	3	2×1+1	coal	1.31	4.76	140	d
10/12/90	Mr. Aldo	5600	2	Y	44.2	14.6	14	2×1+3×4	grain	2.74	2.78	130	d
	Floyd H. Blaske	5000	2	Y	51.8	12.2	12	3×4	grain	1.63	2.18	115	u

Kampsville Site, Trip 1 (Concluded)

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
10/13/90	Marvin E. Norman	1800	2	N	31.1	10.4	16	3×5+1	grain	0.61	1.69	115	u
	Luke Burton	4200	2	Y	43.9	10.7	3	1×3	mixed	2.74	2.93	138	u
	Sugarland	3375	3	N	42.1	12.8	12	3×4	grain	2.29	1.88	170	u
	William C. Norman	1800	2	N	33.5	10.4	12	3×4	grain	2.74	2.90	138	d
	Frank H. Peavey	3800	2	N	42.7	11.6	23	4×5+3	grain	1.17	1.75	150	u
	Conti Karla	3060	2	N	34.8	10.5	16	3×5+1	grain	2.34	1.70	145	u
	Margaret O.	5600	2	Y	42.1	13.4	10	2×5	grain	2.53	2.75	150	u
10/14/90	Lydia E. Campbell	4200	2	Y	43.9	10.7	3	1×3	grain	2.74	3.24	180	u
	Mr. Paul	5600	2	Y	44.2	14.6	8	2×4	chemical	1.68	2.76	155	d
	Rambler	2000	2	N	27.4	9.1	12	3×4	grain	2.74	2.48	138	d
	Mr. Lawrence	5600	2	Y	44.2	14.6	15	3×5	grain	1.75	2.56	165	u
	Mallard	1650	2	N	26.8	9.1	7	3×2+1	mixed	2.13	2.68	175	u
	Charles Lehman	5600	2	Y	44.2	14.6	13	1+3×4	coal	2.74	1.85	145	u
	Nicolas Duncan	1530	2	N	39.0	8.5	9	3×3	grain	2.74	1.52	130	u
	Jeffboat	6000	2	Y	44.2	14.6	15	3×5	grain	2.74	1.84	115	u
	Mary Ann	2250	2	N	30.5	9.1	15	3×5	grain	0.61	1.90	105	u
10/15/90	Ardyce Randall	5600	2	Y	44.2	14.6	15	3×5	grain	2.74	2.36	155	d
	Mr. Paul	5600	2	Y	44.2	14.6	15	3×5	grain	1.61	2.25	130	u
	Exxon St. Louis	3800	2	N	42.7	13.4	4	2×2	petroleum	2.74	2.25	175	u
	Margaret O.	5600	2	Y	42.1	13.4	12	3×4	cargo	2.03	3.83	130	d
	Mr. Lawrence	5600	2	Y	44.2	14.6	15	3×5	cargo	2.74	3.16	115	d
	A.L. Smith	1800	2	N	-	-	8	2×4	cargo	2.48	2.80	140	d
	Ste. Genevieve	1600	2	N	23.2	7.9	12	3×4	cargo	0.61	1.66	150	u
10/17/90	Nicole Brent	1400	2	N	22.9	7.9	2	1×2	chemical	2.74	2.86	150	u
	Frank H. Peavey	3800	2	N	42.7	11.6	5	1+2×2	cargo	2.74	3.05	170	d

Kampsville Site, Trip 2

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
8/13/91	Ranger	850	2	Y	21.3	6.1	5	2×2+1	hopper & chemical	2.74	1.90	190	d
	Dixie Patriot	3200	2	N	33.5	10.4	3	1×3		2.74	2.48	135	d
	Orleanian	4300	2	N	42.7	11.6	13	3×4+1			2.02	120	u
	Pat Breen	5600	2	Y	44.2	14.6	15	3×5		1.52	2.29	120	d
	Dixie Express	1700	2	N	26.2	8.5	2	1×2		1.52	3.40	140	d
	Jo Anne Stegbauer	3200	2	N	36.6	10.7	2	1×2	chemical			110	u
	Ste. Genevieve	200	2	N	12.2	4.6	11	2+3×3	empty		2.48	100	u
	Bob White	3600	2	N	40.5	10.5	9	3×3	closed hopper		1.37	205	d
8/14/91	Night-14-01						11	2+3×3			1.62	100	u
	Night-14-02						9	3×3	chemical		4.05	210	d
	Irving Crown	2400	2	N	31.4	9.1	7	3+2×2		2.74	1.59	180	u
	Gordon Jones	4200	2	N	44.8	11.7	15	3×5		2.74		130	d
	George W. Schamblin	1800	2	N	26.1	9.1	2	2×1		0.61	3.83	130	d
	Katherine L.	1600	2	N	31.1	8.5	2	1×2		0.61	3.21	160	d
	Thruston B. Morton	4200	2	N	45.7	10.7	12	3×4		1.52	2.18	160	u
	Julie White	1700	2	N	26.8	11.6	12	3×2+2×3			2.20	130	u
	Ranger	850	2	Y	21.3	6.1	1	1×1	empty		3.50	110	u
	Illini	1600	2	N	24.4	8.5	12	3×4			2.18	170	u
	Bronwynne Brent	5400	2	Y	42.7	12.8	6	2×3		0.61	2.32	140	d
	Sugarland	3375	3	N	42.1	12.8	1	1×1		0.61			u
	Frank Stegbauer	3200	2	N	39.6	10.7	1	1×1	chemical	0.61			d

Kampsville Site, Trip 2 (Concluded)

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
8/15/91	Bill McCormick	3200	2	Y	45.3	10.5	8	2×4		2.74	2.07		d
	Marvin E. Norman	1800	2	N	31.1	10.4	6	2×3			1.75	150	d
	Olmstead	5920	2	Y	42.1	13.4	15	3×5	coal		2.19	140	u
	Jack D. Wofford	5000	2	Y	51.8	12.2	15	3×5		2.74	2.22	140	u
	Dixie Express	1800	2	N	30.5	8.5	2	1×2		2.74	2.58	160	u
	Hal D. Miller	2400	2	N	32.9	9.8	2	1×2	work		2.33	150	d
	Jesse Brent	4300	2	N	36.6	12.2	2	2×1	hopper	1.52	3.72	180	d

Apple River Island Site

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
5/18/90	Mississippi Belle II											220	u
	Yazoo	2550	3	N	32.9	9.2	15	3×5		1.85	1.43	215	u
	Cooperative Ambassador	3800	2	Y	48.8	12.2	15	3×5		2.67	2.13	275	u
	Christine Bailey	5200	2	N	42.7	11.6	15	3×5		2.74	3.29	245	d
	Kathy Ellen	3800	2	N	46.0	10.6	10	3×3+1		2.32	1.83		u
5/19	W.A. Kernan	5600	2	Y	44.2	14.6	16	3×5+1		0.61	2.00	220	u
	Hornet	4300	2	N	44.5	11.6	4	2×2		2.74	2.77	230	d
	Conti Bonnie	6000	2	Y	44.2	14.6	17	3×5+2		0.61	3.43	215	u
	Becky Lynn	5600	2	Y	42.7	12.8	16	3×5+1		1.52	2.84	215	u
	Twilight												
	Lexington	5600	2	Y	51.8	12.2	15	3×5		2.74	3.99	215	d

Apple River Island Site (Continued)

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
5/20/90	Philip M. Pfeffer	6140	2	Y	42.7	12.8	15	3×5		2.74	3.62	230	d
	Merlin Banta	2800	2	N	38.4	8.8	4			0.61	2.32	230	d
	Mississippi Belle II										7.38	250	d
	Rusty Flower	4200	2	Y	42.7	12.8	16	3×5+1		1.18	2.96	215	u
	Tom Talbert	5600	2	Y	51.2	12.2	15	3×5		0.61	3.41	230	u
	Twilight												
	Julia Swain												
	Herman Pott	5600	2	Y	51.2	12.2	15	3×5		2.74	2.44	215	u
5/21/90	Walter Brunson	4200	2	N	45.7	10.7	15	3×5		0.61	3.05	215	u
	Dell Butcher	5000	2	Y	51.8	12.2	15	3×5		2.74	4.33	230	d
	Missippi Belle II												
	Mary Gail	1200	2	N	19.8	7.3	4	2×2		0.61	3.30	230	u
	Julia Swain												
	T.S. Kunsman	4200	2	N	45.7	10.7	12	3×4		2.74	4.15	230	d
	Twilight												
	D. Ray Miller	5600	2	Y	44.2	14.6	11	3×4-1		2.16	2.22	215	u
5/22/90	Mississippi Belle II												
	Mary Gail	1200	2	N	19.8	7.3	4	2×2		2.74	3.96	230	d
	Trojan	1350	2	N	21.3	7.9	9	3×3		2.74	2.68	215	d
	Melinda Brent	1880	2	N	26.2	8.4	2	2×1	Super Jumbo	0.61	2.38	250	u
	Twilight												
	Julia Swain												
	Cooperative Mariner	3700	2	N	51.2	12.2	12	3×4		2.74	4.66	230	d
	Ed Renshaw	5600	2	Y	51.8	13.7	9	3×3		2.74	3.05	250	u

Apple River Island Site (Concluded)

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
5/23/90	Kevin Michael	5600	2	N	54.0	12.8	16	3×5+1		0.61	2.68	215	u
	Mississippi Belle II												
	Julia Swain												
	Twilight												
	Jack D. Wofford	5000	2	Y	51.8	12.2	2	1×2		2.74	2.87	215	u
	Trojan	1350	2	N	21.3	7.9	5	1+2×2		0.61	2.38	215	u

Goose Island Site, Trip 1

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
8/24/90	Sierra Dawn	5000	2	Y	50.0	12.2	11	2+3×3		2.74	2.72	320	d
	Dell Butcher	5000	2	Y	51.8	12.2	13	1+3×4		2.74	3.17	300	d
	William C. Norman	1800	2	N	33.5	10.4	16	3×5+1		0.61	1.83	320	u
	Normania	1800	2	N	27.4	9.1	16	3×5+1		0.61	1.26	320	u
	Dave Carlton	6000	2	Y	51.8	13.7	15	3×5		2.74	3.50	300	d
8/25/90	Hugh C. Blaske	5000	2	Y	51.8	12.2	15	3×5		2.60	1.88	310	u
	Teresa R. Beesber	4200	2	Y	35.4	10.4	15	3×5		2.74	3.58	280	d
	Trojan Warrior	2800	2	Y	33.5	10.4	4	2×2		2.74	1.42	320	u
	Hoosier State	4320	2	Y	45.7	14.6	13	1+3×4		0.61	2.83	310	u
8/26/90	Reliance	2800	2	N	50.9	11.1	15	3×5		2.74	3.03	320	d
	Kevin Michael	5600	2	N	54.0	12.8	15	3×5		2.74	2.91	310	d
	Sumac	1965	3	N	34.9	9.3	1	1×1	Buoy Tender	2.74	3.54	300	d
	Twin Cities	4200	2	Y	44.1	11.0	13	1+3×4		2.57	2.19	320	u
	Cooperative Vanguard	3700	2	N	51.2	12.2	15	3×5		0.61	2.22	320	u
8/27/90	Superior	3900	2	N	39.6	11.3	5	1+2×2		2.74	0.98	320	u
	Helen M. Clements	5100	3	N	42.7	13.7	15	3×5		2.60	2.36	320	d

Goose Island Site, Trip 2

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
7/18/91	Ardyce Randall	5600	2	Y	44.2	14.6	15	3×5	closed hopper	2.74	3.11	305	d
	Scarlet Knight	4200	2	N	42.7	12.8	15	3×5	closed hopper	2.74	3.20	305	d
	James F. Neal	6000	2	Y	44.2	14.6	15	3×5	closed hopper	2.74	4.05	305	d
	Helen M. Clements	5100	3	N	42.7	13.7	16	3×5+1	closed hopper	0.61	2.44	330	u
	Elizabeth Ann	1350	2	N	21.3		15	3×5	closed hopper	2.74	3.20	330	d
7/19/91	Frank T. Heffelfinger	3800	2	N	42.7	11.6	15	3×5	closed hopper jumbo	2.74	2.99	305	d
	Queen City	5600	2	Y	42.7	12.8	15	3×5	closed hopper	2.74	3.54	350	d
	Helen M. Clements	5100	3	N	42.7	13.7	15	3×5	closed hopper	2.74	2.83	310	d
	Frank T. Heffelfinger	3800	2	N	42.7	11.6	15	3×5	coal barge	2.74	2.38	350	u
	Cooperative Venture	3700	2	N	51.2	12.2	15	3×5	closed hopper	0.61	2.54	350	u
	Volunteer State	4320	2	Y	45.7	14.6	15	3×5	closed hopper	2.74	3.00	350	d
	No Name						15	3×5	closed hopper	2.74	3.46		d
	Night 1						9	3×3	chemical barge	0.61	1.75		u
7/20/91	Night 2						6	3×2	barge	0.61	2.29		u
	G.R. Packet	4200	2	N	44.8	11.6	15	3×5	closed hopper	2.74	3.00	300	d
	Prairie Dawn	5000	2	Y	50.0	12.2	15	3×5	closed hopper	2.74	2.68	310	d
	Prosperity	3800	2	N	51.2	12.2	15	3×5	closed hopper	0.61	1.93	310	u
	Clyde Butcher	5000	2	Y	51.8	12.2	15	3×5	closed hopper	2.74	3.62	350	d
	Lil Charley	1000	2	N	19.8	7.3	2	1×2	closed hopper	2.74	4.95	330	d
	C.W. Rushing	1200	1	N	32.3	10.4	1	1×1	barge	2.13	5.39	305	d
	Conti-Nan	4200	2	N	42.7	13.4	16	3×5+1	closed hopper	0.61	2.30	350	u
	Mary L.	4300	2	N	44.5	11.6	15	3×5	closed hopper	2.74	3.00	305	d

Goose Island Site, Trip 2 (Continued)

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
7/21/91	Cooperative Vanguard	3700	2	N	51.2	12.2	14	3x4+2		1.52	2.83	310	u
	Conti-Karla	3060	2	N	34.7	10.5	15	3×5	closed hopper	2.74	3.46	305	d
7/22/91	Cooperative Mariner	3700	2	N	51.2	12.2	15	3×5	closed hopper	2.74	2.89	315	d
	Hornet	4300	2	N	44.5	11.6	15	3×5	closed hopper	2.74	3.14	300	d
	Cooperative Ambassador	3800	2	Y	48.8	12.2	15	3×5	closed hopper	1.32	2.83	330	u
	Eastern	3530	2	Y	50.9	11.1	15	3×5	closed hopper	0.61	1.55	380	u
	Sam M. Fleming	4100	2	Y	43.9	10.7	8	3×5	barge	2.74	2.67	300	u
	Kevin Michael	5600	2	N	54.0	12.8	15	3×5	closed hopper	2.74	2.94	320	d
7/23/91	A.M. Thompson	3800	2	N	43.3	10.4	15	3×5	closed hopper	2.74	2.86	330	d
	Susan Elizabeth	760	2	N	17.1	5.7	1	3×5	closed hopper	2.74		380	u
	Lil Charley	1000	2	N	19.8	7.3	1	1x1		2.74	4.95	300	u
	Badger	3800	2	N	45.7	10.7	15	3×5	closed hopper	2.74	3.62	310	d
	Kay D	1800	2	N	32.9	6.1	2	3×5		2.74	3.66	330	d
	Every-T	4300	2	N	42.7	11.6	16	3×5+1	closed hopper	0.61	2.32	320	u
	Robert Ingle	3600	2	Y	48.8	10.7	15	3×5	closed hopper	2.74	2.63	310	d
	Prairie Dawn	5000	2	Y	50.0	12.2	15	3×5	closed hopper	0.61	3.72	330	u

Goose Island Site, Trip 2 (Concluded)

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
7/24/91	G.R. Packet	4200	2	N	44.8	11.6	16	3×5+1		1.41	2.91	305	u
	Mary L	4300	2	N	44.5	11.6	16	3×5+1	closed hopper	0.61	2.34	320	u
	Dub Hollinger	2880	2	N	39.2	8.5	14	2×5+4	closed hopper	0.61	2.65	310	u
	C.W. Rushing	1200	1	N	32.3	10.4	1	1×1	closed hopper	2.74	2.68	320	u
	Dell Butcher	5000	2	Y	51.8	12.2	15	3×5	closed hopper	2.74	3.19	330	d
	Coral Dawn	5000	2	Y	50.0	12.2	15	3×5	closed hopper	0.61	2.23	320	u
	Teresa R. Beesecker	4200	2	Y	35.4	10.4	15	3×5	closed hopper	0.61	2.80	305	u
	Sirene	800	2	N	16.5	7.3	6	2×3	closed hopper	2.74	2.97	320	d
	Rusty Flavers	4200	2	Y	42.7	12.8	15	3×5	closed hopper	0.61	2.27	320	u

Clarks Ferry Site, Trip 1

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
5/16/91	C.W. Rushing (1)	1200	1	N	32.3	10.4	2	1×2	cargo	2.74	2.02	325	u
	Donnie Ray Jr. (1)	5600	2	Y	53.7	12.2	15	3×5	cargo	2.66	3.35	250	d
	Samantha (1)	1000	2	N	18.2	6.7	1	1×1	coal	2.74	3.66	270	d
	Samantha (2)	1000	2	N	18.2	6.7	0			2.74	2.61	270	u
5/17/91	Quad City Queen											250	d
	C.W. Rushing (2)	1200	1	N	32.3	10.4	1	1×1	cargo	1.52	2.02	270	d
	Jemco Towing						4	2×2	cargo	2.74	2.97	275	u
	T.S. Kunsman	4200	2	N	45.7	10.7	12	3×4	cargo	2.74	2.54	370	d
	Dell Butcher (1)	5000	2	Y	51.8	12.2	10	2×5	cargo	2.74	2.16	270	u

Clarks Ferry Site, Trip 1 (Continued)

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
5/18/91	William Earthman	4100	2	Y	43.9	10.7	4	2×2	chemical	1.52	2.54		u
	Lady Lone Star	760	2	N	23.8	7.3	0			2.74	2.98	250	u
5/19/91	Pearl B.	4400	2	N	42.7	9.1	12	3×4	cargo	2.74	2.87	250	d
	Conti-Afton	4200	2	N	42.7	13.4	15	3×5	cargo	2.74	3.88	300	d
	Jack D. Wofford	5000	2	Y	51.8	12.2	12	3×4	cargo	2.74	3.7	300	d
	Creole Belle	3900	2	N	39.6	11.3	16	3×5+1	empty	0.61	2.03	225	u
5/20/91	Donnie Ray Jr. (2)	5600	2	Y	53.7	12.2	15	3×5	cargo	2.74	3.00	225	u
	Sunflower (1)	825	3	N	16.8	6.71	1	1×1	cargo	0.61	5.59	250	d
	American Beauty(1)	5000	2	Y	51.8	13.7	15	3×5	cargo	0.61	3.23	275	u
5/21/91	Sierra Dawn	5000	2	Y	50	12.2	12	3×4	cargo	2.64	3.33	270	d
	Coop. Vanguard	3700	2	N	51.2	12.2	6	3×2	cargo	2.74	2.69	250	d
	Cindy J. Erickson	3900	2	N	36.6	11.6	15	3×5	cargo	0.61	2.37	250	u
	Frank H. Peavey	3800	2	N	42.7	11.6	12	3×4	cargo	2.74	3.28	275	d
	Helen M. Clements	5100	3	N	42.7	13.7	12	3×4	cargo	0.61	2.51	260	u
	Sunflowers (2)	825	3	N	16.8	6.71	1	1×1	cargo	1.52	5.6	225	d
	Dell Butcher (2)	5000	2	Y	51.8	12.2	12	3×4	cargo	2.74	3.24	300	d
	Hornet	4300	2	N	44.5	11.6	12	3×4	cargo	0.61	2.97	280	u
	Volunteer State	4320	2	N	45.7	14.6	15	3×5	cargo	0.61	3.51	250	u
	Enterprise Star						15	3×5	cargo	2.74	5.31	275	d

Clarks Ferry Site, Trip 1 (Concluded)

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
5/22/91	Edward J. Hancock	4320	2	Y	45.1	10.4	13	3×4+1	cargo	.61	1.83	250	u
	Joe/Nut	5600	4	N	49.3	13.7	1			2.74	2.74	300	u
	Starfire	3200	2	N	47.6	10.7	10	1+3×3	cargo	1.89	1.98	250	u
	Conti-Karla	3060	2	N	34.7	10.5	16	3×5+1	cargo	0.74	2.00	275	u
	American Beauty(2)	5000	2	Y	51.8	13.7	3	1+2×1	cargo	1.52	5.18	300	d

Clarks Ferry Site, Trip 2

Date	Name	Hp	Screws	Kort	Length (m)	Width (m)	No. of barges	Config	Type of barge	Draft (m)	Speed (m/s)	Dist. (m)	Direction
10/17/91	C.W. Rushing	1200	1	N	32.3	10.4	2	2×1	hopper	1.52	3.98	220	d
	Evey-T	4300	2	N	42.7	11.6	13	1+3×4	empty	.61	2.41	260	u
	Sunflower (1)	825	3	N	16.8	6.7	1	1×1	empty	.61	4.25	185	d
	Evelyn C.	2200	2	N	25.9	10.7	5	1+2×2	Corp of Eng. work barge	2.74	1.92	220	d
	Sunflower (2)	825	3	N	16.8	6.7	1	1×1	hopper	2.74	3.13	210	u
	Conti-Nan (1)			N			15	3×5	hopper	2.74	2.41	260	d
	Night 1			N			1	1×1	work	2.74		250	u
	Night 2			N			1	1×1	hopper	1.52	4.25	230	u
	Night 3			N			6	3×2	work	2.74		230	d
10/18/91	Lady Lone Star	760	2	N	23.8	7.3	1	1×1	coal	2.74	2.38	200	d
	Lady Lone Star	760	2	N	23.8	7.3	0			2.74	3.4	260	u
	Kevin Michael	5600	2	N	54	12.8	12	3×4	closed hopper	2.74	2.31	245	d
	Deborah Valentine	4300	2	Y	47	12.2	15	3×5	closed hopper	2.74	2.14	210	d
	Volunteer State	4320	2	Y	45.7	14.6	4	2×2	closed hopper	2.74	4.25	185	d
	Sunflower (3)	825	3	N	16.8	6.7	1	1×1	closed hopper	.61	4.25	230	d
	Frank Stegbauer	3200	2	N	39.6	10.7	3	1+2×1	empty chemical	.61	2.57	185	d
	Joshua	1000	2	N	18.3	6.7	1	1×1	coal	2.74	2.48	240	d

Clarks Ferry Site, Trip 2 (Concluded)

Date	*Name*	*Hp*	*Screws*	*Kort*	*Length (m)*	*Width (m)*	*No. of barges*	*Config*	*Type of barge*	*Draft (m)*	*Speed (m/s)*	*Dist. (m)*	*Direction*
10/19/91	Kathy Ellen	3800	2	N	46	10.7	15	3×5	closed hopper	2.74	1.92	195	d
	Jack Bullard	5600	2	Y	44.2	14.6	14	2×1+3×4	hopper	2.74	2.38	215	u
	Marc	1000	2	N	18.3	6.7	4	2×2	coal	2.74	2.7	205	d
	Conti-Nan (2)	4200	2	N	42.7	13.4	6	3×2	empty chemical	.61	2.84	185	u
	Cristina Ecstein	3200	2	N	35.4	10.5	8	3×2+2×1	empty	.61	2.88	215	u
	Coast Guard 65504	600	2	N	19.8	6.4	1	1×1	buoy tender/work barge	2.74	4.95	225	d
	Prairie Dawn	5000	2	Y	50	12.2	11	3×3+2	empty	.61	3.4	190	u
10/20/91	Noname						2	2×1	chemical	2.74	2.63	230	d
	Coop. Ambassador	3800	2	Y	48.8	12.2	15	3×5	closed hopper	2.74	2.22	190	d
	Yazoo City	4300	2	N	44.8	10.7	14	2+3×4	closed hopper		2.09	230	u
	George W. Banta	2400	2	N	30.2	9.1	3	1×3	petroleum	2.74	2.0	200	u

APPENDIX VIII.

RECREATIONAL TRAFFIC CHARACTERISTICS AT ALL STUDY SITES

McEver's Island Site
(NA)

Kampsville Site, Trip 1

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Houseboat	10/14/90	12:41	Medium	168	N/A	d/s

Kampsville Site, Trip 2
(N/A)

Apple River Island Site

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Cabin Cruiser	5/21/90	12:09	N/A	244	9	u/s
Mississippi Belle II	5/22/90	9:57	N/A	229	45	d/s

Goose Island Site, Trip 1

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Houseboat	8/25/90	12:23	High	350	N/A	u/s
Houseboat	8/25/90	13:05	N/A	350	N/A	u/s

Notes: N/A = not applicable
u/s = upstream
d/s = downstream

Preceding Page Blank

Goose Island Site, Trip 2

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Houseboat	7/21/91	13:40	Medium	N/A	13.72	u/s
Houseboat	7/21/91	15:31	Slow	N/A	10.50	u/s

Clarks Ferry Site, Trip 1

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Houseboat	5/18/91	15:14	N/A	N/A	12.19	d/s
Houseboat	5/19/91	12:44	N/A	250	N/A	d/s
Houseboat	5/19/91	14:17	N/A	270	N/A	u/s
Houseboat	5/19/91	15:40	N/A	220	N/A	d/s
Houseboat	5/19/91	17:17	Slow	250	N/A	u/s
Houseboat	5/20/91	14:13	N/A	250	N/A	u/s
Cruiser	5/21/91	10:22	Medium	300	N/A	u/s

Clarks Ferry Site, Trip 2

Type	*Date*	*Time*	*Approx. Speed*	*Approx. Distance (m)*	*Approx. Length (m)*	*Direction*
Cruiser	10/18/91	7:39	Medium	220	N/A	d/s
Houseboat	10/18/91	11:01	Slow-medium	280	N/A	d/s
Cruiser	10/19/91	14:47	Medium	220	N/A	d/s
Cruiser	10/19/91	17:15	Medium	N/A	N/A	u/s
Houseboat	10/20/91	9:38	Slow	150	N/A	d/s

Notes: N/A = not applicable
u/s = upstream
d/s = downstream

APPENDIX IX.

WIND SPEED AND DIRECTION AT ALL STUDY SITES

McEver's Island Site
(NA)

Kampsville Site, Trip 1

Date	*Time*	*Wind* Speed (mile/hr)	*Wind* Direction
10/12/90	10:30	1.2	58
	11:00	0.9	66
10/13/90	10:00	2.5	152
	10:30	2.6	152
10/14/90	9:30	5.3	161
	10:00	5.9	164
	10:30	5.9	165
	11:00	3.3	164
	11:30	3.6	147
	12:00	5.3	160
	12:30	5.8	154
	13:00	5.1	147
	13:30	4.5	112
10/15/90	10:00	0.4	64
	10:30	0.9	86
	11:00	0.6	53
	11:30	1.1	88
	12:00	1.0	108
	12:30	2.0	115
	13:00	2.0	55
	13:30	1.4	53
	14:00	1.2	101
	14:30	1.6	105
	15:00	1.0	124
	15:30	1.1	228
	16:00	1.3	224
	16:30	2.8	155
	17:00	4.2	120

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Kampsville Site, Trip 1 (Concluded)

Date	Time	Wind Speed (mile/hr)	Wind Direction
10/16/90	9:00	3.7	169
	9:30	4.6	166
	10:00	4.7	169
	10:30	5.8	162
	11:00	6.3	162
	11:30	5.4	162
	12:00	6.7	160
	12:30	5.6	163
	13:00	5.3	161
	13:30	4.7	165
	14:00	3.5	165
	14:30	2.9	164
	15:00	3.9	165
	15:30	4.4	168
	16:00	3.4	173
	16:30	2.8	184
	17:00	1.3	241
	17:30	1.1	216
	18:00	1.8	204
10/17/90	10:00	8.8	166
	10:30	7.2	165
	11:00	7.2	165
	11:30	5.5	166
	12:00	6.2	169
	12:30	5.7	168
	13:00	5.3	166

Kampsville Site, Trip 2

(NA)

Apple River Island Site

Date	Time	Wind: Speed (mile/hr)	Wind: Direction
5/19/90	17:30	4.1	196
5/20/90	10:30	0.5	52
	11:00	0.7	220
	11:30	0.8	219
	12:00	0.6	176
	12:30	1.3	116
	15:00	1.5	35
	15:30	0.6	42
	16:00	1.4	51
	16:30	0.2	49
	17:00	0.4	84
	17:30	0.2	62
5/21/90	10:30	1.0	173
	12:00	1.4	120
	12:30	1.6	39
	13:00	1.0	131
	13:30	1.3	103
	14:00	1.3	180
	14:30	0.5	125
	15:00	1.1	108
	15:30	0.4	93
	16:30	1.2	72
	17:30	0.5	149

Apple River Island Site (Concluded)

Date	Time	Wind Speed (mile/hr)	Wind Direction
5/22/90	10:00	2.6	282
	10:30	2.4	289
	11:00	2.8	272
	11:30	1.9	262
	12:00	1.5	266
	12:30	1.6	252
	13:00	1.6	276
	13:30	2.2	258
	14:00	1.6	261
	14:30	1.2	188
	15:00	0.9	239
	15:30	2.4	272
	16:00	0.9	77
	16:30	1.2	184
	17:00	2.0	279
5/23/90	9:30	2.9	205
	10:00	4.1	254
	10:30	6.5	276
	11:00	5.3	273
	11:30	6.4	238
	12:00	5.3	235
	12:30	5.5	288
	13:00	4.7	311
	13:30	2.0	293
	14:00	4.5	279
	14:30	2.9	239
	15:00	4.2	278
	15:30	4.8	262
	16:00	4.1	285
	16:30	3.8	254
	17:00	4.9	245
	17:30	3.2	247
	18:00	2.8	226

Goose Island Site, Trip 1

Date	Time	Wind Speed (mile/hr)	Wind Direction
8/24/90	10:30	4.3	121
	11:00	6.9	135
	11:30	6.8	134
	12:00	7.3	136
	12:30	7.9	127
	13:00	7.1	125
	13:30	6.4	135
	14:00	7.1	134
	14:30	7.6	127
	15:00	5.8	139
	15:30	6.5	117
	16:00	5.7	113
	16:30	6.7	125
	17:00	6.7	132
	17:30	6.7	122
8/25/90	10:30	0.4	137
	11:00	3.5	136
	11:30	4.6	128
	12:00	4.2	115
	12:30	6.4	130
	13:00	8.3	119
	13:30	7.6	139
	14:00	7.0	126
	14:30	8.4	131
	15:00	9.5	135
	15:30	7.2	105
	16:00	11.3	149
	16:30	10.7	134
	17:00	9.5	128
8/26/90	10:00	3.1	154
	10:30	3.3	139
	11:00	3.8	129
	11:30	3.1	139
	12:00	2.5	131
	12:30	3.4	136
	13:00	2.2	137
	13:30	3.0	122
	14:00	2.7	139

Goose Island Site, Trip 1 (Concluded)

Date	*Time*	*Wind*	
		Speed (mile/hr)	*Direction*
	14:30	3.6	128
	15:00	3.3	111
	15:30	3.3	131
	16:00	4.2	131
	16:30	5.1	127
8/27/90	10:00	2.2	196
	10:30	2.8	124
	11:00	4.6	133
	11:30	4.2	125
	12:00	5.1	129
	12:30	4.9	123
	13:00	4.1	154
	13:30	4.8	183
	14:00	5.3	183
	14:30	3.7	206
	15:00	3.5	183
	15:30	4.1	265

Goose Island Site, Trip 2

Date	*Time*	*Wind*	
		Speed (mile/hr)	*Direction*
7/18/91	10:00	2.1	180
	10:30	2.5	171
	11:00	2.5	183
	11:30	4.6	154
	12:00	2.6	176
	12:30	4.6	135
	13:00	5.9	133
	13:30	6.8	122
	14:00	3.9	177
	14:30	4.9	179
	15:00	3.6	191
	15:30	5.9	152
	16:00	6.4	136
	16:30	6.0	141

Goose Island Site, Trip 2 (Continued)

Date	*Time*	*Wind* Speed (mile/hr)	*Wind* Direction
	17:00	6.6	156
	17:30	7.8	151
	18:00	5.0	161
7/19/91	10:30	8.4	142
	11:00	6.9	151
	11:30	7.5	159
	12:00	4.0	163
	12:30	10.4	141
	13:00	7.3	154
	13:30	4.0	167
	14:00	8.8	135
	14:30	7.7	160
	15:00	8.9	152
	15:30	7.7	146
	16:00	7.7	143
	16:30	8.4	144
	17:00	6.3	152
	17:30	8.2	139
	18:00	7.7	151
	18:30	5.6	171
	19:00	4.9	142
	19:30	5.5	128
7/22/91	9:30	5.1	251
	10:00	7.7	263
	10:30	8.2	281
	11:00	8.1	272
	11:30	9.0	89
	12:00	9.9	109
	12:30	7.8	263
	13:00	5.0	175
	13:30	5.3	265
	14:00	3.8	250
	14:30	2.9	249
	15:00	1.3	249
	15:30	1.3	192
	16:00	3.0	193
	16:30	3.6	163
	17:00	3.1	207

Goose Island Site, Trip 2 (Concluded)

Date	Time	Wind Speed (mile/hr)	Wind Direction
	17:30	2.1	166
	18:00	3.7	153
7/23/91	9:30	10.2	240
	10:00	4.7	239
	10:30	4.1	218
	11:00	9.2	260
	11:30	5.7	231
	12:00	6.2	240
	12:30	7.9	253
	13:00	3.3	219
	13:30	5.4	244
	14:00	5.2	231
	14:30	6.2	192
	15:00	6.2	208
	15:30	6.5	193
	16:00	4.4	217
	16:30	6.6	202
	17:00	9.9	141
7/24/91	10:30	1.5	245
	11:00	1.6	251
	11:30	3.5	290
	12:00	2.3	126
	12:30	3.0	300
	13:00	3.0	252
	13:30	2.2	316
	14:00	2.4	283
	14:30	2.7	298
	15:00	8.8	292
	15:30	4.2	277
	16:00	1.9	213
	16:30	1.1	282
	17:00	1.4	274
	17:30	0.9	160

Clarks Ferry Site, Trip 1

Date	Time	Wind Speed (mile/hr)	Wind Direction
5/17/91	11:00	4.5	101
	11:30	2.3	80
	12:00	2.5	83
	12:30	3.3	89
	13:00	2.2	82
	13:30	3.1	88
	14:00	2.6	76
	15:00	2.2	81
	15:30	2.4	79
	16:00	2.4	75
5/18/91	10:00	3.4	91
	10:30	3.5	39
	11:00	3.3	60
	11:30	2.9	71
	12:00	3.2	39
	12:30	4.9	39
	13:00	4.3	70
	13:30	4.0	171
5/19/91	9:00	4.9	113
	9:30	3.2	146
	10:00	2.7	185
	10:30	3.4	168
	11:00	3	170
	11:30	2.6	176
	12:00	2.7	185
	12:30	2.4	169
	13:00	2.8	106
	13:30	3.0	96
	14:00	3.3	91
	14:30	3.0	101
	15:00	2.9	86
	15:30	3.9	79
	16:00	2.6	84
	16:30	3.1	102
	17:00	2.5	76
	17:30	4.1	69

Clarks Ferry Site, Trip 1 (Concluded)

Date	*Time*	*Wind*	
		Speed (mile/hr)	*Direction*
5/20/91	9:30	1.9	116
	10:00	1.4	90
	10:30	1.4	100
	11:00	1.3	83
	11:30	1.5	89
	12:00	1.1	65
	12:30	1.2	88
	13:00	1.5	122
	13:30	1.6	84
	14:00	1.5	64
	14:30	1.5	61
	15:00	1.7	71
	15:30	1.7	79
	16:00	1.8	64
	16:30	1.5	78
	17:00	1.2	79
	17:30	1.1	78
	18:00	1.0	62
5/21/91	8:30	1.0	87
	9:30	1.0	77
	10:00	2.0	116
	10:30	5.2	143
	11:00	4.7	140
	11:30	5.0	127
	12:00	5.1	131
	12:30	2.7	132
	13:00	1.3	120
	13:30	3.8	163
	14:00	5.5	170
	14:30	2.9	167
	15:00	3.9	156
	15:30	4.9	150
	16:00	4.4	170
	16:30	4.6	169
	17:00	4.9	154
	17:30	2.2	180
	18:00	3.1	179

Wind Wave Event

Kampsville, Illinois River

Date: 10/17/90

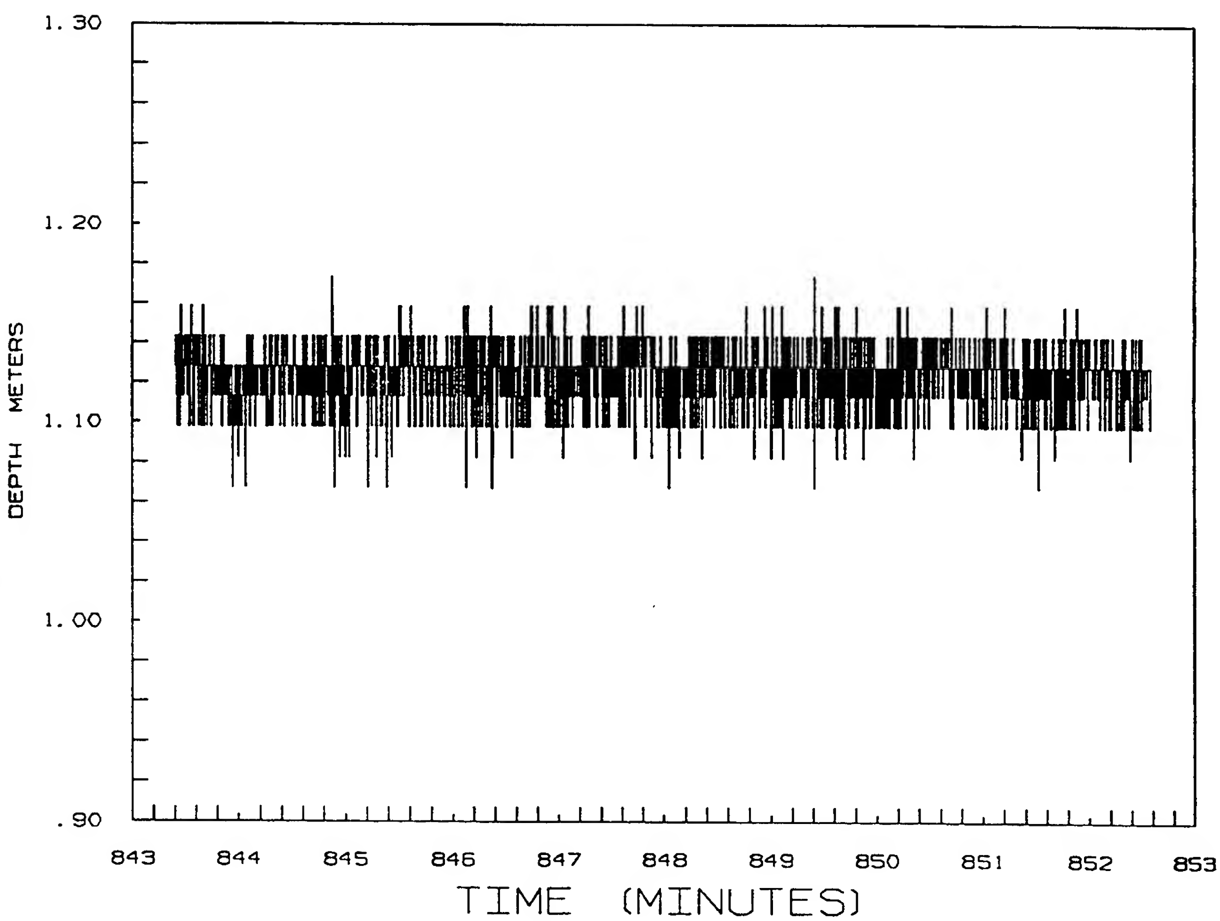
Max. wave height = 0.107 m

Significant wave height = 0.05 m

Sampling rate = 10

Starting time = 14: 12: 34

Mean wave height = 0.04 m



APPENDIX X.

DATE AND TIME OF PASSAGE OF BARGE-TOWS AND MEAN AMBIENT VELOCITY BEFORE BARGE-TOW PASSAGE FOR ALL STUDY SITES

McEver's Island Site

Tow name	Date	Passing Time Beginning	Passing Time Ending	MMB511/998 U_{ma}, V_{ma}	MMB511/999 U_{ma}, V_{ma}	MMB511/1000 U_{ma}, V_{ma}	MMB511/1001 U_{ma}, V_{ma}
R.W. Naye	5/16/89	14:23:30	14:26:32	0.070, 0.008	-	-	-
Evelyn C.		14:46:35	14:46:45	*	-	-	-
Mary Ellen	5/17/89	7:57:10	7:59:50	0.045, -0.003	-	-	-
Elaine Jones		8:07:00	8:09:22	*	-	-	-
Nicholas Duncan		15:29:38	15:33:40	0.320, 0.000	-	-	-
Mobil Leader	5/18/89	9:39:47	9:41:21	-	0.090, 0.000	0.060, -0.006	*
Reliance		12:16:45	12:19:13	-0.005, -0.018	0.115, -0.003	0.055, -0.008	*
Cooperative Vanguard		12:41:49	12:44:03	-0.019, -0.008	0.080, 0.002	0.040, -0.007	*
Marvin Norman		13:09:20	13:11:27	0.005, -0.002	0.100, 0.000	0.074, -0.008	*
Illini		14:31:36	14:33:34	-0.020, -0.015	0.092, 0.008	0.053, -0.003	*
Thurston B. Morton	5/19/89	10:37:56	10:40:40	-	0.099, 0.000	0.065, -0.005	*
Clarence G. Frame		10:45:36	10:47:40	-	0.098, 0.005	0.068, 0.000	*

Mean ambient velocity m/s

- Meter was not available
* Meter did not work

McEver's Island Site (Concluded)

		Passing Time		Mean ambient velocity m/s	
				MMB527/642	S4/071
Tow name	*Date*	*Beginning*	*Ending*	U_{ma}, V_{ma}	U_{ma}, V_{ma}
R.W. Naye	5/16/89	14:23:30	14:26:32	0.170, -0.005	0.070, -0.003
Evelyn C.		14:46:35	14:46:45	*	*
Mary Ellen	5/17/89	7:57:10	7:59:50	0.195, -0.050	0.053, -0.018
Elaine Jones		8:07:00	8:09:22	*	*
Nicholas Duncan		15:29:38	15:33:40	0.140, 0.000	-
Mobil Leader	5/18/89	9:39:47	9:41:21	-	0.030, 0.004
Reliance		12:16:45	12:19:13	0.110, -0.003	0.010, -0.020
Cooperative Vanguard		12:41:49	12:44:03	0.070, -0.004	0.018, -0.035
Marvin Norman		13:09:20	13:11:27	0.117, 0.003	0.080, 0.013
Illini		14:31:36	14:33:34	0.095, -0.006	-
Thurston B. Morton	5/19/89	10:37:56	10:40:40	-	*
Clarence G. Frame		10:45:36	10:47:40	-	0.093, -0.038

- Meter was not available
* Meter did not work

Kampsville Site, Trip 1

		Passing Time		Mean ambient velocity m/s				
				MMB511/1001	MMB511/998	MMB511/999	MMB511/1000	MMB511/642
Tow name	*Date*	*Beginning*	*Ending*	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Mr. Aldo	10/12/90	13:34:46	13:36:48	*	0.271, N/A	0.335,-0.014	0.456,-0.008	0.422-0.022
Floyd Blaske		13:47:57	13:50:10	*	0.253,-0.005	0.318,-0.011	0.450,-0.022	0.445-0.017
Marvin Norman	10/13/90	09:31:13	09:34:45	0.190, -0.007	0.333, -0.015	0.327, -0.020	*	0.435, 0.010
Luke Burton		09:55:32	09:56:38	0.196, -0.005	0.334, 0.004	0.330,-0.016	0.466, 0.024	0.433, 0.017
Sugarland		09:58:35	10:01:18	0.196, -0.006	0.334, 0.004	0.330,-0.016	0.466, 0.024	0.433, 0.017
William C. Norman		11:08:41	11:10:15	0.204,-0.006	0.289, 0.007	0.341,-0.018	0.420,0.041	0.438, 0.014
Frank H. Peavey		15:20:29	15:24:20	0.191,-0.006	0.295, 0.010	0.362, 0.003	0.397, 0.013	0.420, 0.015
Conti Karla		16:23:56	16:27:38	0.204,-0.007	0.295, 0.011	0.356, 0.002	0.410, 0.018	0.424, 0.017
Mr. Paul	10/14/90	10:17:12	10:18:58	0.211, -0.005	0.257, 0.024	0.397, 0.002	0.500, 0.040	0.443, -0.013
Rambler		10:56:37	10:58:25	0.226, -0.002	0.290, 0.027	0.381, N/A	0.470, 0.030	0.438, 0.016
Mr. Lawrence		11:42:09	11:44:22	0.216, -0.005	0.292, 0.025	0.385, 0.020	0.470, 0.032	0.445, 0.018
Mallard		12:25:38	12:26:51	0.211, -0.002	0.290, 0.020	0.378, N/A	0.470, 0.032	0.441, -0.022
Charles Lehman		13:28:18	13:31:24	0.215,-0.001	0.298, 0.032	0.397, 0.032	0.504, 0.038	0.446, 0.016
Nicholas Duncan		15:29:11	15:31:36	0.230, -0.002	0.250, 0.026	0.395, 0.029	0.485, 0.035	0.467, 0.018
Jeff Boat		15:57:43	16:00:46	0.235,-0.005	0.241, 0.025	0.380, 0.025	0.480, 0.035	0.461, 0.015
Mary Ann		16:36:20	16:39:11	0.217, 0.000	0.245, 0.029	0.390, 0.032	0.515, 0.018	0.450, -0.020
Ardyce Randall	10/15/90	09:49:07	09:51:32	0.235, -0.002	*	*	*	0.470, 0.011
Mr. Paul		12:07:21	12:09:53	0.227,-0.006	0.351, 0.039	0.411, 0.032	*	0.459, 0.017
Exxon St. Louis		14:51:40	14:53:18	0.240, -0.005	0.357, 0.034	0.411, 0.027	0.620, 0.000	0.477, 0.015
Margaret O.		15:11:17	15:12:29	0.220, -0.005	0.350, 0.036	0.405, 0.030	0.422, 0.015	0.455, 0.020
Mr. Lawrence		18:10:53	18:12:36	0.225, -0.005	0.374, 0.034	0.432, 0.028	0.390, 0.015	0.485, 0.017
A.L. Smith	10/16/90	10:27:27	10:29:00	0.240, -0.002	0.375, 0.010	0.460, -0.007	0.780, 0.005	0.460, 0.016
Ste. Genevieve		16:19:41	16:22:00	0.230,-0.005	0.378, 0.000	0.445, -0.022	0.720, 0.007	0.475, 0.018
Nicole Brent	10/17/90	10:25:21	10:26:31	0.234, 0.000	0.410, 0.037	0.335, 0.030	*	0.470, 0.014
Frank H. Peavey		11:14:06	11:15:20	0.240,-0.002	0.435, 0.028	0.330, 0.075	*	0.480, 0.013

* Meter did not work

Kampsville Site, Trip 1 (Concluded)

Tow name	Date	Passing Time		Mean ambient velocity m/s		
				MMB511/332	MMB527/040	MMB527/071
		Beginning	Ending	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}
Mr. Aldo	10/12/90	13:34:46	13:36:48	0.520,-0.018	0.443,-0.020	0.468, 0.010
Floyd Blaske		13:47:57	13:50:10	0.560,-0.020	0.460,-0.018	0.470,-0.002
Marvin Norman	10/13/90	09:31:13	09:34:45	0.531, 0.005	*	0.445, 0.010
Luke Burton		09:55:32	09:56:38	0.528,-0.005	*	0.440, 0.002
Sugarland		09:58:35	10:01:18	0.528,-0.005	*	0.440, 0.005
William C. Norman		11:08:41	11:10:15	0.546,-0.004	0.455,0.010	0.445, 0.004
Frank H. Peavey		15:20:29	15:24:20	0.498, 0.005	0.430, 0.007	0.455,-0.001
Conti Karla		16:23:56	16:27:38	0.505, 0.000	0.432, 0.010	0.480,-0.008
Mr. Paul	10/14/90	10:17:12	10:18:58	0.525,-0.025	*	0.455, 0.006
Rambler		10:56:37	10:58:25	0.540,-0.024	0.461, 0.031	*
Mr. Lawrence		11:42:09	11:44:22	0.525,-0.019	0.444, 0.025	0.470,-0.002
Mallard		12:25:38	12:26:51	0.520,-0.025	0.455, 0.021	0.478, 0.006
Charles Lehman		13:28:18	13:31:24	0.535,-0.021	0.440, 0.026	0.460, 0.001
Nicholas Duncan		15:29:11	15:31:36	0.560,-0.024	0.450, 0.021	0.477, 0.006
Jeff Boat		15:57:43	16:00:46	0.550,-0.020	0.470, 0.019	0.480, 0.015
Mary Ann		16:36:20	16:39:11	0.550, 0.028	0.490, 0.021	0.490, 0.008
Ardyce Randall	10/15/90	09:49:07	09:51:32	0.541,-0.007	0.440, 0.021	0.465, 0.004
Mr. Paul		12:07:21	12:09:53	0.535,-0.006	0.440, 0.020	0.470,-0.010
Exxon St. Louis		14:51:40	14:53:18	0.558,-0.005	0.450, 0.020	*
Margaret O.		15:11:17	15:12:29	0.550, 0.000	0.480, 0.021	0.485, 0.000
Mr. Lawrence		18:10:53	18:12:36	0.540,-0.012	*	*
A.L. Smith	10/16/90	10:27:27	10:29:00	0.530, -0.005	0.452, 0.020	0.490, 0.004
Ste. Genevieve		16:19:41	16:22:00	0.525,-0.014	0.449, 0.029	0.470, 0.000
Nicole Brent	10/17/90	10:25:21	10:26:31	0.510,-0.025	0.465, 0.015	0.450, 0.005
Frank H. Peavey		11:14:06	11:15:20	0.515,-0.020	0.475, 0.005	0.460, 0.009

* Meter did not work

Kampsville Site, Trip 2

Tow name	Date	Passing Time		Mean ambient velocity m/s		
				MMB511/1001	MMB511/998	MMB511/999
		Beginning	Ending	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}
Ranger	8/13/91	10:08:48	10:10:32	*	*	0.139,0.002
Dixie Patriot		10:48:40	10:50:01	*	0.151, 0.018	0.148, 0.006
Orleanian		16:39:53	16:42:40	0.073, 0.006	*	0.155, 0.000
Pat Breen		17:45:36	17:47:58	0.052, 0.005	*	0.116, 0.002
Dixie Express		18:15:23	18:16:04	0.091, 0.000	*	0.139, 0.001
Night-14-01	8/14/91	04:21:06	04:23:57	0.122, -0.001	*	0.128, 0.005
Night-14-02		07:15:57	07:16:51	0.106, 0.001	*	0.147, 0.004
Irving Crown		10:08:34	10:10:45	0.073, 0.006	0.070, N/A	0.212, 0.009
George W. Shamblin		13:16:16	13:16:56	0.096, 0.001	*	0.123,-0.011
Katherine L.		13:26:36	13:27:20	0.092, 0.001	0.311, -0.002	0.151, -0.016
Thruston B. Morton		14:21:58	14:23:57	0.063, 0.004	*	0.121, -0.016
Julie White		14:32:12	14:35:45	0.031, 0.002	*	0.119,-0.024
Ranger		17:07:52	17:08:16	0.071, 0.006	*	0.125,-0.016
Illini		19:12:43	19:14:43	0.051, 0.007	*	0.092, -0.015
Bronwynne Brent		19:23:50	19:25:19	0.046, 0.007	*	0.083,-0.011
Bill McCormick	8/15/91	00:02:15	00:04:28	0.109, 0.005	*	*
Marvin E. Norman		03:27:22	03:29:18	0.108, 0.002	*	*
Olmstead		13:02:42	13:05:16	0.067, 0.003	0.072,-0.028	0.129,-0.010
Jack D. Wofford		13:39:18	13:41:57	0.064, 0.010	0.073,-0.025	0.121,-0.019
Dixie Express		15:09:12	15:10:08	0.067, 0.011	0.056,-0.021	0.110,-0.015
Hal D. Miller		17:45:56	17:46:56	0.072, 0.009	0.071,-0.024	0.118,-0.012
Jesse Brent		18:10:31	18:10:55	0.071, 0.010	0.074,-0.027	0.140,-0.019

* Meter did not work

Kampsville Site, Trip 2 (Concluded)

Tow name	*Date*	*Passing Time*		*Mean ambient velocity m/s*		
				MMB511/1000	*MMB527/642*	*MMB527/332*
		Beginning	*Ending*	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Ranger	8/13/91	10:08:48	10:10:32	*	0.020, N/A	0.166, 0.012
Dixie Patriot		10:48:40	10:50:01	0.391, 0.000	0.029, -0.003	0.170, 0.010
Orleanian		16:39:53	16:42:40	*	0.140,-0.004	0.159, 0.006
Pat Breen		17:45:36	17:47:58	*	0.119, -0.001	0.151, 0.018
Dixie Express		18:15:23	18:16:04	*	0.138,-0.006	0.174, 0.012
Night-14-01	8/14/91	04:21:06	04:23:57	*	0.132,-0.010	0.175, 0.008
Night-14-02		07:15:57	07:16:51	*	0.138,-0.010	0.162, 0.004
Irving Crown		10:08:34	10:10:45	*	0.129,-0.015	0.142,-0.016
George W. Shamblin		13:16:16	13:16:56	*	*	0.136, 0.010
Katherine L.		13:26:36	13:27:20	0.319, 0.018	*	0.149, 0.008
Thruston B. Morton		14:21:58	14:23:57	*	*	0.156, 0.013
Julie White		14:32:12	14:35:45	*	*	0.160, 0.026
Ranger		17:07:52	17:08:16	*	*	0.160, 0.009
Illini		19:12:43	19:14:43	*	*	0.127, 0.012
Bronwynne Brent		19:23:50	19:25:19	*	*	0.118, 0.010
Bill McCormick	8/15/91	00:02:15	00:04:28	*	*	0.150, 0.008
Marvin E. Norman		03:27:22	03:29:18	*	*	0.170, 0.006
Olmstead		13:02:42	13:05:16	0.023, 0.004	*	0.180, 0.012
Jack D. Wofford		13:39:18	13:41:57	*	*	0.141, 0.013
Dixie Express		15:09:12	15:10:08	*	0.095, 0.000	0.159, 0.010
Hal D. Miller		17:45:56	17:46:56	*	0.142,-0.006	0.142, 0.006
Jesse Brent		18:10:31	18:10:55	*	0.123,-0.004	0.141, 0.008

* Meter did not work

Apple River Island Site

Tow name	Date	Passing Time		Mean ambient velocity m/s				
				MMB511/1001	MMB511/1000	MMB511/998	MMB527/642	MMB527/332
		Beginning	Ending	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Yazoo	5/18/90	16:20:16	16:23:41	0.228, -0.009	0.253, -0.021	0.358, -0.024	0.297, -0.001	0.118, -0.001
Cooperative Ambassador		16:46:42	16:48:55	0.212, -0.005	0.252, -0.025	*	0.288, -0.003	0.143, 0.001
Christine Bailey		17:21:24	17:23:17	0.227, -0.008	0.241, -0.018	*	0.265, -0.001	0.129, 0.000
Kathy Ellen		20:07:30	20:09:39	0.219, -0.004	0.241, -0.018	*	0.256, 0.001	0.117, -0.002
W.A. Kernan	5/19/90	10:04:10	10:07:04	0.221, -0.006	0.228, -0.023	0.317, 0.013	0.158, -0.009	-0.005, -0.009
Hornet		11:20:37	11:21:31	0.221, 0.001	0.229, -0.021	0.351, -0.016	0.151, -0.001	0.091, -0.010
Conti-Bonnie		11:40:41	11:42:25	0.229, 0.001	0.245, -0.021	0.371, -0.004	0.149, -0.009	0.101, -0.010
Becky Lynn		11:56:12	11:58:03	0.211, -0.001	0.229, -0.022	0.382, 0.011	0.152, -0.010	0.110, -0.009
Merlin Banta	5/20/90	09:09:21	09:10:12	0.211, 0.001	0.241, -0.015	*	0.132, 0.013	0.053, -0.007
Rusty Flowers		11:27:57	11:29:38	0.209, -0.001	0.241, -0.006	0.383, -0.050	0.110, 0.012	*
Tom Talbert		12:36:12	12:37:48	0.219, -0.001	0.228, -0.019	0.377, -0.039	0.091, 0.027	*
Herman Pott		15:33:19	15:35:31	0.222, -0.003	0.221, -0.016	0.389, -0.024	0.072, 0.022	*
Walter Brunson	5/21/90	10:06:14	10:08:09	0.226, 0.000	0.261, -0.014	*	0.493, 0.005	0.378, -0.025
Dell Butcher		11:00:40	11:02:30	0.220, 0.001	0.251, -0.015	0.353, -0.018	0.521, 0.015	0.380, -0.020
Mary Gail		14:19:17	14:20:01	0.248, -0.009	0.228, -0.018	0.455, -0.010	0.488, 0.001	0.357, 0.001
T.S. Kunsman		14:37:15	14:38:33	0.247, -0.001	0.239, -0.014	0.453, 0.007	0.490, 0.003	0.378, -0.001
D. Ray Miller		14:55:21	14:57:23	0.242, -0.009	0.250, -0.014	0.469, 0.041	0.482, 0.001	0.391, -0.011
Mary Gail	5/22/90	10:09:50	10:10:25	0.238, -0.010	0.258, -0.012	*	0.520, -0.017	0.358, -0.016
Trojan		17:08:42	17:09:52	0.249, -0.003	0.242, -0.014	0.500, -0.031	0.554, -0.024	0.354, -0.006
Melinda Brent		17:28:40	17:29:27	0.240, -0.001	0.249, -0.012	0.502, -0.031	0.498, -0.026	0.351, -0.002
Corporative Mariner		18:06:22	18:07:30	0.239, -0.001	0.246, -0.010	*	0.518, -0.020	0.353, -0.016
Ed Renshaw			19:49:48	-	-	-	-	-
Kevin Michael	5/23/90	06:52:42	06:55:13	-	-	-	-	-
Jack D. Wofford		16:13:23	16:14:20	0.241, -0.001	0.228, -0.011	0.502, 0.012	0.506, -0.001	0.312, -0.001
Trojan		16:23:20	16:24:42	0.238, -0.001	0.231, -0.010	0.503, 0.012	0.529, -0.001	0.309, 0.009

- Meter was not available
* Meter did not work

Apple River Island Site (Concluded)

Tow name	Date	Passing Time: Beginning	Passing Time: Ending	Mean ambient velocity m/s: MMB511/999 U_{ma}, V_{ma}	Mean ambient velocity m/s: S4/071 U_{ma}, V_{ma}	Mean ambient velocity m/s: S4/040 U_{ma}, V_{ma}
Yazoo	5/18/90	16:20:16	16:23:41	*	-	-
Cooperative Ambassador		16:46:42	16:48:55	*	-	-
Christine Bailey		17:21:24	17:23:17	*	-	-
Kathy Ellen		20:07:30	20:09:39	*	-	-
W.A. Kernan	5/19/90	10:04:10	10:07:04	*	0.624, -0.048	-
Hornet		11:20:37	11:21:31	*	0.647, -0.049	-
Conti-Bonnie		11:40:41	11:42:25	*	0.640, -0.055	-
Becky Lynn		11:56:12	11:58:03	*	0.648, -0.061	-
Merlin Banta	5/20/90	09:09:21	09:10:12	*	-	0.561, 0.004
Rusty Flowers		11:27:57	11:29:38	*	-	*
Tom Talbert		12:36:12	12:37:48	*	-	0.627, 0.014
Herman Pott		15:33:19	15:35:31	*	0.670, -0.051	*
Walter Brunson	5/21/90	10:06:14	10:08:09	*	0.597, -0.087	*
Dell Butcher		11:00:40	11:02:30	*	0.578, -0.091	*
Mary Gail		14:19:17	14:20:01	*	-	0.520, -0.082
T.S. Kunsman		14:37:15	14:38:33	*	0.559, -0.070	0.588, -0.090
D. Ray Miller		14:55:21	14:57:23	*	0.567, -0.079	0.591, -0.093
Mary Gail	5/22/90	10:09:50	10:10:25	*	0.583, -0.102	0.579, -0.090
Trojan		17:08:42	17:09:52	*	0.568, -0.104	0.558, -0.091
Melinda Brent		17:28:40	17:29:27	*	0.588, -0.109	*
Corporative Mariner		18:06:22	18:07:30	*	0.561, -0.101	*
Ed Renshaw			19:49:48	*	*	0.570, -0.090
Kevin Michael	5/23/90	06:52:42	06:55:13	*	-	0.592, -0.090
Jack D. Wofford		16:13:23	16:14:20	*	-	0.609, -0.081
Trojan		16:23:20	16:24:42	*	-	-

- Meter was not available
* Meter did not work

Goose Island Site, Trip 1

Tow name	*Date*	*Passing Time*		*Mean ambient velocity m/s*				
				MMB511/1001	*MMB511/998*	*MMB511/999*	*MMB511/1000*	*MMB527/B642*
		Beginning	*Ending*	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Sierra Dawn	8/24/90	10:51:08	10:52:54	0.428, -0.008	0.409, -0.004	0.443, -0.003	0.294, 0.003	0.350, -0.018
Dell Butcher		13:42:01	13:43:52	0.409, -0.011	0.391, 0.020	0.429, -0.014	0.281, 0.001	0.366, -0.019
William C. Norman		13:54:34	13:57:35	0.294, -0.006	0.397, 0.020	0.428, -0.019	0.295, 0.001	0.353, -0.011
Normania		14:16:33	14:20:50	0.408, 0.012	0.381, 0.019	0.419, -0.019	0.285, 0.001	0.353, -0.015
Dare Carlton		16:39:17	16:40:57	0.417, 0.003	0.377, 0.019	0.406, -0.025	0.259, 0.006	*
Hugh C. Blaske	8/25/90	11:19:46	11:22:52	0.394, 0.030	0.371, 0.020	0.459, -0.016	0.287, -0.001	0.493, -0.001
Teresa Renee B.		12:15:45	12:17:17	0.358, 0.020	0.373, 0.020	0.467, -0.014	0.296, 0.001	0.492, 0.001
Trojan Warrior		12:24:48	12:26:28	0.349, 0.020	0.364, 0.020	0.457, -0.015	0.291, 0.001	0.491, 0.002
Hoosier State		15:45:01	15:47:01	0.324, 0.012	0.352, 0.020	0.408, -0.022	0.279, -0.001	0.458, 0.001
Kevin Michael	8/26/90	11:46:36	11:48:36	-	0.373, 0.020	0.448, 0.020	0.270, 0.009	-
Sumac		13:27:02	13:27:21	-	0.341, -0.007	0.447, 0.030	0.266, 0.011	-
Twin City		14:21:22	14:24:00	-	0.346, 0.020	0.443, 0.012	0.258, 0.015	-
Cooperative Vangard		14:58:35	15:01:11	-	0.358, 0.020	0.451, 0.011	0.260, 0.012	-
Superior	8/27/90	09:54:38	09:58:22	-	0.457, -0.020	0.547, 0.025	*	-
Helen M. Clements		12:36:11	12:38:32	-	0.428, 0.030	0.512, 0.013	0.358, 0.020	-

- Meter was not available
* Meter did not work

Goose Island Site, Trip 1 (Concluded)

Tow name	Date	Passing Time		Mean ambient velocity m/s		
				MMB527/B332	S4/071	S4/040
		Beginning	Ending	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Sierra Dawn	8/24/90	10:51:08	10:52:54	0.393, -0.001	0.504, -0.012	0.478, 0.084
Dell Butcher		13:42:01	13:43:52	0.389, 0.002	0.378, -0.034	0.472, 0.870
William C. Norman		13:54:34	13:57:35	0.381, 0.027	0.358, -0.037	0.462, 0.094
Normania		14:16:33	14:20:50	0.319, -0.009	*	0.481, 0.097
Dare Carlton		16:39:17	16:40:57	0.223, 0.032	0.458, 0.013	-
Hugh C. Blaske	8/25/90	11:19:46	11:22:52	0.152, -0.001	0.383, -0.012	0.469, 0.072
Teresa Renee B.		12:15:45	12:17:17	0.117, -0.002	*	0.432, 0.051
Trojan Warrior		12:24:48	12:26:28	0.109, -0.010	0.422, -0.070	0.416, 0.048
Hoosier State		15:45:01	15:47:01	0.242, 0.011	0.327, 0.002	0.482, 0.062
Kevin Michael	8/26/90	11:46:36	11:48:36	-	*	0.451, 0.129
Sumac		13:27:02	13:27:21	-	*	0.465, 0.041
Twin City		14:21:22	14:24:00	-	-	0.455, 0.038
Cooperative Vangard		14:58:35	15:01:11	-	-	0.432, 0.052
Superior	8/27/90	09:54:38	09:58:22	-	-	-
Helen M. Clements		12:36:11	12:38:32	-	-	-

- Meter was not available
* Meter did not work

Goose Island Site, Trip 2

Tow name	Date	Passing Time		Mean ambient velocity m/s				
				MMB511/1001	MMB511/1130	MMB511/1131	MMB511/998	MMB511/999
		Beginning	Ending	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}
Ardyce Randall	7/18/91	10:42:18	10:44:10	0.054, -0.009	0.091, -0.001	0.062, 0.001	0.024, 0.010	0.038, -0.016
Scarlet Knight		12:26:59	12:28:46	0.306, 0.009	0.232, 0.014	0.261, 0.003	-0.017, 0.010	0.048, -0.020
James F. Neal		14:17:04	14:18:34	0.301, 0.010	0.158, 0.006	0.267, 0.002	-0.001, 0.009	0.036, -0.018
Helen M. Clements		17:23:03	17:25:22	0.288, 0.010	0.166, 0.010	0.259, 0.010	0.010, 0.007	0.036, -0.020
Elizabeth Ann		18:00:59	18:02:46	-	-	-	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	0.298, 0.011	0.142, 0.014	0.218, 0.006	0.029, 0.011	0.005, -0.003
Queen City		14:33:45	14:35:21	0.259, 0.010	0.132, 0.011	0.197, 0.002	0.018, 0.011	*
Helen M. Clements		16:24:27	16:26:12	0.251, 0.009	0.121, 0.014	0.185, 0.001	*	0.012, 0.001
Frank T.Heffelfinger		16:33:21	16:36:52	0.252, 0.009	0.124, 0.014	0.183, 0.001	*	0.006, -0.001
Cooperative Venture		18:05:37	18:08:27	0.272, -0.010	0.138, 0.003	0.195, 0.004	*	*
Volunteer State		18:55:16	18:56:45	0.262, 0.010	0.140, 0.007	0.192, 0.001	-	-
Prairie Dawn	7/20/91	8:09:31	8:11:39	-	-	-	-	-0.001, -0.006
Prosperity		8:19:27	8:22:28	-	-	-	-	0.011, 0.006
Clyde Butcher		11:39:19	11:40:55	-	-	-	-	-
Lil Charley		11:55:54	11:56:27	-	-	-	-	-
C.W. Rushing		13:31:19	13:31:38	*	0.142, 0.009	0.214, 0.003	-	0.011, 0.001
Conti-Nan		16:56:41	16:59:16	0.261, 0.011	0.218, 0.013	0.206, 0.010	*	*
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	0.280, 0.006	0.202, -0.001	0.241, 0.002	0.009, 0.009	0.009, -0.006
Conti-Karla		14:57:38	14:59:13	0.259, 0.004	0.206, 0.005	0.239, 0.009	-0.011, -0.002	0.047, -0.011
Cooperative Mariner	7/22/91	10:34:47	10:36:47	0.254, 0.015	0.129, 0.011	0.240, 0.004	0.041, -0.004	0.071, -0.008
Hornet		12:11:57	12:13:47	0.249, 0.016	0.189, 0.011	0.230, 0.006	0.024, -0.006	0.056, -0.010
Cooperative Ambassador		13:16:41	13:18:43	0.248, 0.012	0.201, 0.003	0.229, 0.003	0.012, -0.004	0.080, 0.010
Eastern		13:20:30	13:23:42	0.251, 0.011	0.198, 0.003	0.230, -0.001	0.011, -0.003	0.079, 0.011
Sam M. Fleming		13:24:11	13:25:52	0.254, 0.011	0.197, 0.003	0.238, 0.001	0.028, -0.003	0.088, 0.010
Kevin Michael		14:00:12	14:02:12	0.241, 0.011	0.206, 0.004	0.232, 0.004	*	*
A.M. Thompson	7/23/91	14:12:24	14:14:23	0.265, 0.014	0.209, 0.003	0.239, 0.006	*	0.084, 0.014
Lil Charley		14:20:30	14:20:55	0.249, 0.016	0.193, 0.004	0.221, 0.006	*	0.088, 0.021
Badger		15:55:55	15:57:30	0.266, 0.016	0.190, 0.001	0.244, 0.007	*	0.075, 0.015
Kay D		15:59:29	16:00:13	0.263, 0.015	0.197, 0.001	0.245, 0.009	*	0.092, 0.021

Goose Island Site, Trip 2 (Continued)

Tow name	*Date*	*Passing Time*		*Mean ambient velocity m/s*				
				MMB511/1001	*MMB511/1130*	*MMB511/1131*	*MMB511/998*	*MMB511/999*
		Beginning	*Ending*	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
Evey-T		16:24:21	16:26:55	0.260, 0.016	0.185, 0.001	0.232, 0.003	*	*
G.R. Packet	7/24/91	8:25:25	8:28:39	0.432, -0.209	0.235, -0.009	0.209, 0.007	-0.005, 0.006	0.073, 0.024
Mary L.		9:14:50	9:17:21	0.423, -0.209	0.237, -0.019	0.210, 0.002	0.048, -0.006	0.147, 0.033
Dud Hollinger		9:58:51	10:02:05	0.412, -0.200	0.240, -0.016	0.209, 0.006	0.036, 0.001	0.135, 0.034
C.W. Rushing		12:13:19	12:13:57	0.409, -0.201	0.230, -0.016	0.219, 0.008	0.021, 0.005	0.084, 0.021
Dell Butcher		13:44:39	13:46:27	0.426, -0.206	0.227, -0.009	0.206, 0.001	0.008, 0.000	0.071, 0.026
Coral Dawn		14:48:44	14:51:19	0.411, -0.203	0.227, -0.015	0.199, 0.002	0.003, 0.006	0.062, 0.021
Teresa R. Beesecker		15:43:33	15:45:33	0.411,-0.205	0.245, -0.019	0.215, 0.006	0.036, 0.001	0.107, 0.037

Goose Island Site, Trip 2 (Continued)

				Induced velocity m/s				
		Passing Time		MMB511/1000	MMB527/642	MMB527/332	S4/071	S4/151
Tow name	*Date*	*Beginning*	*Ending*	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Ardyce Randall	7/18/91	10:42:18	10:44:10	0.031, -0.009	0.443, 0.001	0.527, -0.001	-	-0.086, -0.006
Scarlet Knight		12:26:59	12:28:46	0.051, -0.019	0.482, 0.001	0.481, 0.002	-	-
James F. Neal		14:17:04	14:18:34	0.029, -0.019	0.489, 0.001	0.497, -0.001	0.611, 0.043	0.649, 0.111
Helen M. Clements		17:23:03	17:25:22	0.035, -0.018	0.489, 0.003	0.482, -0.011	-	*
Elizabeth Ann		18:00:59	18:02:46	-	0.525, -0.001	*	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	0.011, 0.000	0.450, -0.001	0.631, -0.011	-	-
Queen City		14:33:45	14:35:21	0.140, -0.010	0.428, -0.011	0.581, -0.011	*	-
Helen M. Clements		16:24:27	16:26:12	0.027, -0.006	0.432, -0.014	0.589, -0.009	0.556, 0.016	-
Frank T.Heffelfinger		16:33:21	16:36:52	0.019, 0.001	0.418, -0.010	0.583, -0.004	0.542, 0.018	-
Cooperative Venture		18:05:37	18:08:27	0.017, 0.010	-	-	-	-
Volunteer State		18:55:16	18:56:45	-	-	-	-	-
Prairie Dawn	7/20/91	8:09:31	8:11:39	0.032, 0.011	-	-	-	0.620, 0.121
Prosperity		8:19:27	8:22:28	0.028, 0.011	0.436, -0.022	0.559, -0.016	-	0.603, 0.122
Clyde Butcher		11:39:19	11:40:55	-	0.391, -0.016	0.547, -0.024	-	0.676, 0.131
Lil Charley		11:55:54	11:56:27	-	0.398, -0.010	0.533, -0.021	-	0.646, 0.119
C.W. Rushing		13:31:19	13:31:38	0.049, -0.006	0.411, -0.022	0.543, -0.010	-	0.621, 0.119
Conti-Nan		16:56:41	16:59:16	0.019, 0.000	0.423, -0.015	0.479, -0.030	-	0.598, 0.119
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	0.011, -0.001	0.451, -0.015	0.499, -0.010	0.497, 0.021	0.611, 0.111
Conti-Karla		14:57:38	14:59:13	*	0.411, -0.014	0.478, -0.015	0.482, 0.025	0.562, 0.091

Goose Island Site, Trip 2 (Continued)

				Induced velocity m/s				
		Passing Time		MMB511/1000	MMB527/642	MMB527/332	S4/071	S4/151
Tow name	Date	Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Cooperative Mariner	7/22/91	10:34:47	10:36:47	0.093, -0.015	0.421, -0.011	0.382, -0.031	-	0.591, 0.109
Hornet		12:11:57	12:13:47	0.079, -0.011	0.411, -0.011	0.497, -0.009	0.473, 0.031	0.582, 0.110
Cooperative Ambassador		13:16:41	13:18:43	0.061, -0.009	0.361, -0.001	0.462, -0.012	0.477, 0.030	0.568, 0.101
Eastern		13:20:30	13:23:42	0.062, -0.011	0.360, -0.001	0.455, -0.011	0.476, 0.033	0.546, 0.102
Sam M. Fleming		13:24:11	13:25:52	0.082, -0.013	0.379, -0.008	0.449, -0.011	0.491, 0.025	0.549, 0.111
Kevin Michael		14:00:12	14:02:12	*	0.413, -0.010	0.447, -0.021	0.461, 0.026	0.581, 0.110
A.M. Thompson	7/23/91	14:12:24	14:14:23	0.067,-0.010	0.421, -0.019	0.468, -0.024	0.512, 0.065	0.555, 0.099
Lil Charley		14:20:30	14:20:55	0.077, -0.003	0.403, -0.018	0.447, -0.021	0.518, 0.063	0.561, 0.102
Badger		15:55:55	15:57:30	0.060, -0.010	0.437, -0.011	0.484, -0.020	0.548, -0.060	0.572, 0.102
Kay D		15:59:29	16:00:13	0.070, -0.013	0.448, 0.015	0.467, -0.021	0.522, 0.061	0.571, 0.117
Evey-T		16:24:21	16:26:55	*	0.445, -0.016	0.492, -0.019	0.531, 0.055	0.579, 0.106
G.R. Packet	7/24/91	8:25:25	8:28:39	0.060, -0.001	0.331, 0.011	0.142, 0.009	-	0.547, 0.095
Mary L.		9:14:50	9:17:21	0.131, -0.021	0.325, 0.011	0.141, 0.011	-	0.566, 0.100
Dud Hollinger		9:58:51	10:02:05	0.112, -0.010	*	0.141, 0.010	0.498, 0.053	0.557, 0.083
C.W. Rushing		12:13:19	12:13:57	0.091, -0.006	0.309, 0.011	0.142, 0.001	0.468, 0.051	0.534, 0.086
Dell Butcher		13:44:39	13:46:27	0.051, 0.001	0.301, 0.011	0.157, -0.001	0.477, 0.055	0.498, 0.079
Coral Dawn		14:48:44	14:51:19	*	0.297, 0.009	0.157, 0.000	0.483, 0.060	0.530, 0.092
Teresa R. Beesecker		15:43:33	15:45:33	0.116, 0.000	0.311, 0.011	0.162, -0.001	0.490, 0.069	0.540, 0.067

Goose Island Site, Trip 2 (Continued)

Tow name	Date	Passing Time		Induced velocity m/s		
				S4/040	S4/832	S4/834
		Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Ardyce Randall	7/18/91	10:42:18	10:44:10	-	0.072, 0.074	0.741, 0.019
Scarlet Knight		12:26:59	12:28:46	-	0.031, 0.048	0.717, 0.001
James F. Neal		14:17:04	14:18:34	0.623, 0.070	-	0.437, 0.617
Helen M. Clements		17:23:03	17:25:22	0.678, 0.142	-	0.404, 0.572
Elizabeth Ann		18:00:59	18:02:46	-	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	-	-	0.691, 0.029
Queen City		14:33:45	14:35:21	-	-	0.686, 0.021
Helen M. Clements		16:24:27	16:26:12	-	-	0.687, 0.011
Frank T.Heffelfinger		16:33:21	16:36:52	-	-	0.693, 0.015
Cooperative Venture		18:05:37	18:08:27	-	-	0.693, 0.019
Volunteer State		18:55:16	18:56:45	-	-	-
Prairie Dawn	7/20/91	8:09:31	8:11:39	-	-	0.657, 0.020
Prosperity		8:19:27	8:22:28	-	-	0.671, 0.028
Clyde Butcher		11:39:19	11:40:55	-	0.659, 0.030	0.681, 0.021
Lil Charley		11:55:54	11:56:27	-	0.673, 0.022	0.698, 0.012
C.W. Rushing		13:31:19	13:31:38	-	0.670, 0.020	0.672, 0.010
Conti-Nan		16:56:41	16:59:16	-	0.680, 0.010	0.679, 0.018
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	0.619, 0.180	0.609, 0.010	0.647, 0.027
Conti-Karla		14:57:38	14:59:13	0.590, 0.151	0.643, 0.010	0.647, 0.014

Goose Island Site, Trip 2 (Concluded)

Tow name	Date	Passing Time Beginning	Passing Time Ending	Induced velocity m/s S4/040 U_{im}, V_{im}	S4/832 U_{im}, V_{im}	S4/834 U_{im}, V_{im}
Cooperative Mariner	7/22/91	10:34:47	10:36:47	0.581, 0.152	0.598, -0.001	0.617, 0.019
Hornet		12:11:57	12:13:47	0.597, 0.160	0.618, 0.010	0.626, 0.019
Cooperative Ambassador		13:16:41	13:18:43	0.550, 0.131	0.595, 0.012	0.599, 0.022
Eastern		13:20:30	13:23:42	0.550, 0.139	0.604, 0.003	0.590, 0.021
Sam M. Fleming		13:24:11	13:25:52	0.584, 0.151	0.640, 0.009	0.616, 0.029
Kevin Michael		14:00:12	14:02:12	0.569, 0.126	0.632, -0.010	0.611, 0.019
A.M. Thompson	7/23/91	14:12:24	14:14:23	0.653, 0.090	0.648, 0.042	0.582, 0.033
Lil Charley		14:20:30	14:20:55	0.588, 0.072	0.628, 0.039	0.592, 0.031
Badger		15:55:55	15:57:30	0.641, 0.100	0.622, 0.050	0.626, 0.030
Kay D		15:59:29	16:00:13	0.611, 0.102	0.600, 0.047	0.631, 0.029
Evey-T		16:24:21	16:26:55	0.609, 0.102	0.631, 0.042	0.641, 0.026
G.R. Packet	7/24/91	8:25:25	8:28:39	0.590, 0.095	0.600, 0.039	0.591, 0.032
Mary L.		9:14:50	9:17:21	0.561, 0.100	0.582, 0.039	-
Dud Hollinger						

Clarks Ferry Site, Trip 1

Tow name	Date	Passing Time		Mean ambient velocity m/s				
		Beginning	Ending	MMB511/1001 U_{ma}, V_{ma}	MMB511/1130 U_{ma}, V_{ma}	MMB511/1131 U_{ma}, V_{ma}	MMB511/998 U_{ma}, V_{ma}	MMB511/999 U_{ma}, V_{ma}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	*	0.198,-0.001	0.248,-0.009	0.483,-0.006	*
Donnie Ray Jr. 1		12:22:50	12:24:30	*	0.386,-0.003	0.479,-0.017	0.481,0.007	*
Samantha		13:26:43	13:27:06	*	0.204,-0.002	0.257,-0.006	0.253,-0.008	0.308,-0.004
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	0.109, 0.016	0.199, 0.008	0.241, 0.011	0.257, 0.010	0.314,-0.001
Jemco Towing		15:03:40	15:04:39	0.121, 0.014	0.197, 0.006	0.247, 0.010	0.278,-0.012	0.317,-0.014
T.S. Kunsman		16:31:55	16:33:22	*	0.206, 0.008	0.264, 0.010	0.271,-0.010	0.337,-0.012
Dell Butcher 1		17:43:27	17:46:12	0.110, 0.018	0.207,-0.020	0.249,-0.016	0.278,-0.012	0.324,-0.011
Pearl B.	5/19/91	10:06:30	10:07:53	-	-	-	-	-
Conti-Afton		11:41:08	11:42:35	-	-	-	-	-
Jack D. Wofford		16:33:57	16:35:16	0.106, 0.002	0.213, 0.010	0.259, 0.011	0.205,-0.011	0.318,-0.010
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	0.108, 0.005	0.210,0.004	0.252, 0.012	0.199, 0.010	0.311,-0.012
Sunflower 1		12:24:22	12:24:37	0.099, 0.005	0.209, 0.001	0.248, 0.012	0.202, 0.015	0.312,-0.007
American Beauty 1		15:48:23	15:50:13	0.101, 0.009	0.209, 0.005	0.256, 0.013	0.202, 0.009	0.319, -0.010
Sierra Dawn	5/21/91	09:09:28	09:11:00	0.113, 0.005	0.210, 0.011	0.246, 0.015	0.221, -0.009	0.319, 0.002
Cooperative Vanguard		09:36:54	09:37:56	0.136, 0.001	0.212, 0.005	0.252, 0.011	0.203,-0.013	0.306,-0.004
Cindy J. Erickson		10:29:26	10:31:47	0.134, 0.000	0.211, 0.010	0.249, 0.011	0.218, -0.011	0.314, -0.004
Frank H. Peavy		10:49:16	10:50:37	0.129,-0.001	0.218, 0.010	0.257, 0.011	0.216,-0.009	0.311,-0.001
Helen M. Clements		11:32:51	11:34:43	0.129,-0.001	0.209, 0.005	0.246, 0.012	0.209,-0.015	0.317,-0.009
Sunflower 2		12:13:06	12:13:22	0.130, 0.001	0.206, 0.002	.246, 0.014	0.214,-0.016	0.324,-0.002
Dell Butcher 2		12:37:20	12:38:44	0.132,-0.001	0.209, 0.004	0.248,0.014	0.208,-0.014	0.307,-0.004
Hornet		13:30:54	13:32:27	0.131, 0.001	0.211, 0.006	0.250, 0.013	0.209,-0.011	0.321,-0.003
Volunteer State		16:08:16	16:09:56	0.128, 0.003	0.211, 0.004	0.247, 0.011	0.217,-0.012	0.323,-0.003
Edward J. Hancock	5/22/91	09:52:51	09:55:33	*	0.205, 0.005	0.248, 0.011	*	0.312,-0.008
Starfire		10:54:32	10:56:51	0.129, 0.004	0.211, 0.007	0.245, 0.009	*	0.313,-0.010
American Beauty 2		13:46:39	13:47:10	0.139, 0.001	0.209, 0.010	0.243, 0.009	0.221,-0.017	0.317,-0.009

- Meter was not available
* Meter did not work

Clarks Ferry Site, Trip 1 (Continued)

Tow name	Date	Passing Time: Beginning	Passing Time: Ending	MMB511/1000 U_{ma}, V_{ma}	MMB527/332 U_{ma}, V_{ma}	MMB527/642 U_{ma}, V_{ma}	S4/151 U_{ma}, V_{ma}	S4/834 U_{ma}, V_{ma}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	0.698,-0.013	0.688, 0.001	0.618,-0.011	*	-
Donnie Ray Jr. 1		12:22:50	12:24:30	0.692,-0.010	0.613, 0.003	0.637,-0.007	*	-
Samantha		13:26:43	13:27:06	0.368,-0.002	0.687,-0.006	0.613,-0.011	*	-
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	0.344, 0.011	0.495, 0.002	*	*	0.287, 0.143
Jemco Towing		15:03:40	15:04:39	0.359,-0.011	0.498,-0.009	0.692, 0.017	0.211,-0.066	0.166, 0.092
T.S. Kunsman		16:31:55	16:33:22	0.361,-0.010	0.489, 0.011	0.646,-0.006	*	0.185, 0.074
Dell Butcher 1		17:43:27	17:46:12	0.341,-0.011	*	*	0.229,-0.054	0.254, 0.133
Pearl B.	5/19/91	10:06:30	10:07:53	-	0.497, 0.001	0.508,-0.010	0.168, 0.019	0.257, 0.121
Conti-Afton		11:41:08	11:42:35	-	0.524,-0.008	0.523,-0.011	0.178, 0.017	0.271, 0.126
Jack D. Wofford		16:33:57	16:35:16	0.352,-0.013	0.515, 0.000	0.507,-0.011	0.242,-0.014	0.388, 0.168
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	0.339,-0.014	0.474, 0.016	0.493,-0.019	*	*
Sunflower 1		12:24:22	12:24:37	0.344,-0.009	0.451, 0.013	0.482,-0.008	*	*
American Beauty 1		15:48:23	15:50:13	0.349,-0.010	0.481, 0.017	0.473,-0.013	*	0.331, 0.158
Sierra Dawn	5/21/91	09:09:28	09:11:00	0.359,-0.006	-	-	*	*
Cooperative Vanguard		09:36:54	09:37:56	0.343,-0.006	-	-	-	*
Cindy J. Erickson		10:29:26	10:31:47	0.348,-0.009	-	-	-	*
Frank H. Peavy		10:49:16	10:50:37	0.352,-0.010	-	-	-	*
Helen M. Clements		11:32:51	11:34:43	0.361,-0.010	-	-	-	-
Sunflower 2		12:13:06	12:13:22	0.363,-0.007	-	-	-	-
Dell Butcher 2		12:37:20	12:38:44	0.348,-0.009	-	-	-	-
Hornet		13:30:54	13:32:27	0.352,-0.009	-	-	-	-
Volunteer State		16:08:16	16:09:56	0.371,-0.010	-	-	-	0.583, 0.029
Edward J. Hancock	5/22/91	09:52:51	09:55:33	0.349,-0.010	-	-	-	0.625, 0.056
Starfire		10:54:32	10:56:51	0.361,-0.015	-	-	-	0.623, 0.043
American Beauty 2		13:46:39	13:47:10	0.377,-0.017	-	-	-	0.615, 0.021

- Meter was not available
* Meter did not work

Clarks Ferry Site, Trip 1 (Concluded)

Tow name	Date	Passing Time		Mean ambient velocity m/s		
		Beginning	Ending	S4/040 U_{ma}, V_{ma}	S4/832 U_{ma}, V_{ma}	S4/071 U_{ma}, V_{ma}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	-	0.746, 0.029	-
Donnie Ray Jr. 1		12:22:50	12:24:30	-	0.798, 0.017	-
Samantha		13:26:43	13:27:06	-	0.754, 0 028	-
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	*	0.321, 0.031	0.591, 0.058
Jemco Towing		15:03:40	15:04:39	*	0.158, 0.021	0.645, 0.062
T.S. Kunsman		16:31:55	16:33:22	*	*	0.584, 0.063
Dell Butcher 1		17:43:27	17:46:12	*	0.210, 0.023	0.643, 0.067
Pearl B.	5/19/91	10:06:30	10:07:53	*	0.209, 0.021	-
Conti-Afton		11:41:08	11:42:35	*	0.216, 0.021	0.556, 0.063
Jack D. Wofford		16:33:57	16:35:16	*	0.294, 0.027	0.547, 0.061
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	0.639--0.007	*	*
Sunflower 1		12:24:22	12:24:37	0.652, 0.014	*	*
American Beauty 1		15:48:23	15:50:13	0.658, 0.003	0.252, 0.021	*
Sierra Dawn	5/21/91	09:09:28	09:11:00	0.616, 0.017	0.268, 0.023	*
Cooperative Vanguard		09:36:54	09:37:56	0.638, 0.016	*	-
Cindy J. Erickson		10:29:26	10:31:47	0.627, 0.022	0.278, 0.023	-
Frank H. Peavy		10:49:16	10:50:37	0.627, 0.016	*	-
Helen M. Clements		11:32:51	11:34:43	0.643, 0.017	*	-
Sunflower 2		12:13:06	12:13:22	0.619, 0.010	*	-
Dell Butcher 2		12:37:20	12:38:44	0.621, 0.016	*	-
Hornet		13:30:54	13:32:27	0.594, 0.012	*	-
Volunteer State		16:08:16	16:09:56	0.603, 0.009	*	0.588, 0.064
Edward J. Hancock	5/22/91	09:52:51	09:55:33	0.635, 0.019	0.237,-0.015	0.607, 0.066
Starfire		10:54:32	10:56:51	0.603, 0.019	*	0.595, 0.061
American Beauty 2		13:46:39	13:47:10	0.632, 0.021	0.199,-0.054	0.603, 0.058

- Meter was not available
* Meter did not work

Clarks Ferry Site, Trip 2

Tow name	Date	Passing Time		Mean ambient velocity m/s				
				MMB511/1001	MMB511/998	MMB511/999	MMB511/1000	MMB511/1130
		Beginning	Ending	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
C.W. Rushing	10/17/91	07:33:54	07:34:17	0.062,-0.005	0.091,-0.009	0.119,-0.006	0.129, 0.003	0.116, 0.010
Evey-T		08:43:43	08:45:34	0.061,-0.001	0.088,-0.008	0.110,-0.006	0.119, 0.005	0.111, 0.100
Sunflower 1		11:43:54	11:44:12	0.055,-0.002	0.081,-0.003	0.110,-0.004	0.131,-0.003	0.106, 0.014
Evelyn C.		11:45:01	11:45:36	0.053,-0.000	0.079,-0.002	0.111,-0.002	0.133,-0.001	0.105, 0.015
Sunflower 2		17:06:09	17:06:35	0.053, N/A	0.099, 0.008	0.116, 0.008	0.133, 0.008	0.132, 0.001
Conti-Nan 1		18:54:59	18:57:14	0.063, N/A	0.095, 0.004	0.116, 0.006	0.125, 0.009	0.134,-0.002
Night 1		20:14:14	20:14:33	0.061, N/A	0.095, 0.007	0.112, 0.005	0.125, 0.009	0.118,-0.000
Night 2		20:19:50	20:20:12	0.058, N/A	0.091, 0.006	0.109, 0.005	0.126, 0.010	0.121,-0.001
Night 3		20:50:43	20:51:25	0.060, N/A	0.096, 0.006	0.116, 0.006	0.124, 0.009	0.124,-0.001
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	0.049, N/A	0.085, 0.006	0.107, 0.002	0.116, 0.008	0.113,-0.005
Lady Lone Star 2		07:43:37	07:43:44	0.049. N/A	0.081, 0.004	0.111, 0.004	0.121, 0.009	0.117,-0.004
Kevin Michael		08:24:59	08:27:08	0.048, N/A	0.083, 0.004	0.110, 0.003	0.123, 0.006	0.111,-0.002
Deborah Valentine		09:55:28	09:58:08	0.049, N/A	0.062, 0.002	0.109, 0.005	0.116, 0.009	0.116,-0.002
Volunteer State		10:06:34	10:07:14	0.051, N/A	0.067, 0.001	0.116, 0.005	0.130, 0.011	0.126,-0.001
Sunflower 3		11:26:47	11:27:04	0.047, N/A	0.055, 0.001	0.106, 0.006	0.119, 0.012	0.116,-0.004
Frank Stegbauer		12:32:08	12:32:52	0.050, N/A	0.057, 0.000	0.109, 0.004	0.117, 0.013	0.113,-0.002
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.054,-0.016	0.085, N/A	0.116, 0.005	0.130, 0.009	0.124,-0.001
Jack Bullard		12:07:14	12:09:42	0.072,-0.006	0.093, 0.005	0.108, 0.002	0.121, 0.009	0.124, 0.000
Marc		12:57:38	12:58:29	0.069,-0.005	0.101, 0.005	0.115, 0.005	0.123, 0.010	0.119, 0.001
Conti-Nan 2		13:44:23	13:45:17	0.064,-0.004	0.091, 0.007	0.106, 0.004	0.119, 0.010	0.126,-0.001
Cristina Ecstein		14:03:17	14:04:18	0.069,-0.007	0.099, 0.006	0.106, 0.004	0.125, 0.007	0.118,-0.001
Coast Guard 65504		14:54:46	14:54:57	0.070,-0.004	0.099, 0.005	0.111, 0.004	0.129, 0.006	0.125,-0.001
Prairie Dawn		17:30:03	17:31:27	0.061, 0.001	0.101, 0.005	0.109, 0.005	0.120, 0.008	0.120, 0.001
Noname	10/20/91	06:54:14	06:55:25	*	0.094, 0.003	0.104, 0.001	0.123, 0.006	*
Coop. Ambassador		07:05:14	07:07:29	0.049, 0.003	0.096, 0.004	0.114, 0.000	0.124, 0.006	0.121,-0.003
Yazoo City		09:31:48	09:34:30	0.056, 0.001	0.091, 0.005	0.109, 0.001	0.130, 0.006	0.116, 0.002
George W. Banta		12:19:36	12:21:59	0.054, 0.001	0.092, 0.005	0.109, 0.004	0.122, 0.006	0.119, 0.000

- Meter was not available
* Meter did not work

Clarks Ferry Site, Trip 2 (Continued)

		Passing Time		Mean ambient velocity m/s			
				MMB511/1131	MMB527/332	MMB527/642	S4/834
Tow name	*Date*	*Beginning*	*Ending*	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}	U_{ma} V_{ma}
C.W. Rushing	10/17/91	07:33:54	07:34:17	0.137, 0.009	0.233, 0.002	0.245,-0.002	-
Evey-T		08:43:43	08:45:34	0.138, 0.007	0.233, 0.001	0.238,-0.001	-
Sunflower 1		11:43:54	11:44:12	0.124, 0.015	0.218, 0.010	0.232, 0.001	*
Evelyn C.		11:45:01	11:45:36	0.124, 0.010	0.218, 0.007	0.238, 0.004	*
Sunflower 2		17:06:09	17:06:35	0.145,-0.000	0.253,-0.011	0.261,-0.001	*
Conti-Nan 1		18:54:59	18:57:14	0.146,-0.003	0.254,-0.003	0.263,-0.011	0.331, 0.049
Night 1		20:14:14	20:14:33	0.131,-0.004	0.238,-0.006	0.238,-0.007	*
Night 2		20:19:50	20:20:12	0.133,-0.004	0.241, 0.001	0.235,-0.010	*
Night 3		20:50:43	20:51:25	0.140,-0.003	0.258, 0.003	0.242, 0.009	*
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	0.129,-0.005	0.231,-0.002	0.238,-0.010	0.409, 0.003
Lady Lone Star 2		07:43:37	07:43:44	0.133,-0.004	0.227,-0.002	0.233,-0.010	*
Kevin Michael		08:24:59	08:27:08	0.126,-0.003	0.223,-0.003	0.229,-0.140	0.418, 0.004
Deborah Valentine		09:55:28	09:58:08	0.131,-0.005	0.229,-0.002	0.238,-0.010	0.417,-0.001
Volunteer State		10:06:34	10:07:14	0.140,-0.004	0.241,-0.000	0.236,-0.011	0.401,-0.001
Sunflower 3		11:26:47	11:27:04	0.131,-0.006	0.230,-0.006	0.232,-0.013	0.394, 0.001
Frank Stegbauer		12:32:08	12:32:52	0.131,-0.005	0.227,-0.005	0.231,-0.015	*
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.142,-0.004	0.241,-0.001	0.233,-0.004	0.408, 0.016
Jack Bullard		12:07:14	12:09:42	0.133,-0.004	0.241,-0.004	0.246,-0.009	0.391, 0.016
Marc		12:57:38	12:58:29	0.135,-0.004	0.241, 0.001	0.248,-0.008	0.409, 0.004
Conti-Nan 2		13:44:23	13:45:17	0.136,-0.004	0.241, 0.006	0.253,-0.006	0.381, 0.018
Cristina Ecstein		14:03:17	14:04:18	0.135,-0.004	0.238, 0.010	0.249,-0.010	0.378, 0.024
Coast Guard 65504		14:54:46	14:54:57	0.144,-0.003	0.243, 0.001	0.249,-0.005	0.384, 0.016
Prairie Dawn		17:30:03	17:31:27	0.134,-0.005	0.231, 0.002	0.259,-0.011	*
Noname	10/20/91	06:54:14	06:55:25	*	0.238, 0.002	*	0.402, 0.002
Coop. Ambassador		07:05:14	07:07:29	0.140,-0.002	0.233,-0.001	*	0.408, 0.005
Yazoo City		09:31:48	09:34:30	0.128,-0.006	0.238, 0.001	0.247,-0.010	*
George W. Banta		12:19:36	12:21:59	0.135,-0.004	0.242, 0.001	0.241, 0.001	0.388, 0.012

- Meter was not available
* Meter did not work

Clarks Ferry Site, Trip 2 (Concluded)

		Passing Time		Mean ambient velocity m/s		
				S4/151	S4/832	S4/040
Tow name	Date	Beginning	Ending	U_{ma}, V_{ma}	U_{ma}, V_{ma}	U_{ma}, V_{ma}
C.W. Rushing	10/17/91	07:33:54	07:34:17	-	-	*
Evey-T		08:43:43	08:45:34	-	-	-
Sunflower 1		11:43:54	11:44:12	0.299, 0.056	0.237, 0.011	*
Evelyn C.		11:45:01	11:45:36	0.300, 0.057	0.243, 0.011	*
Sunflower 2		17:06:09	17:06:35	0.342, 0.068	0.293, 0.006	-
Conti-Nan 1		18:54:59	18:57:14	0.328, 0.060	0.298, 0.014	0.131,-0.002
Night 1		20:14:14	20:14:33	0.308, 0.052	0.280, 0.006	0.151,-0.000
Night 2		20:19:50	20:20:12	0.319, 0.053	0.288, 0.005	*
Night 3		20:50:43	20:51:25	0.313, 0.054	0.279, 0.010	0.131, 0.002
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	0.306, 0.054	0.258, 0.010	*
Lady Lone Star 2		07:43:37	07:43:44	0.303, 0.054	0.262, 0.011	*
Kevin Michael		08:24:59	08:27:08	0.301, 0.051	0.269, 0.011	*
Deborah Valentine		09:55:28	09:58:08	0.298, 0.048	0.267, 0.008	*
Volunteer State		10:06:34	10:07:14	0.312, 0.048	0.278,-0.002	*
Sunflower 3		11:26:47	11:27:04	-	-	*
Frank Stegbauer		12:32:08	12:32:52	0.308, 0.043	0.256, 0.000	*
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.319, 0.060	0.273, 0.014	*
Jack Bullard		12:07:14	12:09:42	0.303, 0.059	*	0.196, 0.012
Marc		12:57:38	12:58:29	0.310, 0.061	0.292, 0.012	*
Conti-Nan 2		13:44:23	13:45:17	0.308, 0.059	0.281, 0.009	*
Cristina Ecstein		14:03:17	14:04:18	0.296, 0.041	0.258, 0.006	*
Coast Guard 65504		14:54:46	14:54:57	0.302, 0.058	0.271, 0.006	0.173, 0.010
Prairie Dawn		17:30:03	17:31:27	0.298, 0.061	0.277, 0.011	0.143, 0.005
Noname	10/20/91	06:54:14	06:55:25	0.298, 0.051	0.287, 0.011	*
Coop. Ambassador		07:05:14	07:07:29	0.301, 0.060	0.294, 0.016	*
Yazoo City		09:31:48	09:34:30	0.301, 0.053	0.260, 0.015	*
George W. Banta		12:19:36	12:21:59	0.300, 0.057	0.283, 0.014	*

- Meter was not available
* Meter did not work

APPENDIX XI.

INDUCED VELOCITY AT ALL SITES AND ALL METERING LOCATIONS DURING BARGE-TOW PASSAGE

McEver's Island Site

Tow name	Date	Passing Time		Induced velocity m/s			
				MMB511/998	MMB511/999	MMB511/1000	MMB511/1001
		Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
R.W. Naye	5/16/89	14:23:30	14:26:32	0.440, 0.038	-	-	-
Evelyn C.		14:46:35	14:46:45	*	-	-	-
Mary Ellen	5/17/89	7:57:10	7:59:50	0.485, 0.058	-	-	-
Elaine Jones		8:07:00	8:09:22	*	-	-	-
Nicholas Duncan		15:29:38	15:33:40	0.550, **	-	-	-
Mobil Leader	5/18/89	9:39:47	9:41:21	-	0.385, 0.036	0.325, 0.025	*
Reliance		12:16:45	12:19:13	0.400, 0.055	0.310, 0.032	0.243, 0.021	*
Cooperative Vanguard		12:41:49	12:44:03	-0.355, -0.127	-0.135, -0.046	-0.120, -0.043	*
Marvin Norman		13:09:20	13:11:27	0.170, 0.030	0.190, 0.024	0.138, 0.020	*
Illini		14:31:36	14:33:34	-0.270, -0.055	-0.062, -0.030	-0.080, -0.032	*
Thurston B. Morton	5/19/89	10:37:56	10:40:40	-	-0.025, -0.035	-0.050, -0.028	*
Clarence G. Frame		10:45:36	10:47:40	-	-0.120, -0.045	-0.110, -0.035	*

Tow name	Date	Passing Time		Induced velocity m/s	
				MMB527/642	S4/071
		Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}
R.W. Naye	5/16/89	14:23:30	14:26:32	0.640, 0.028	0.210, 0.040
Evelyn C.		14:46:35	14:46:45	*	*
Mary Ellen	5/17/89	7:57:10	7:59:50	0.885, **	0.223, 0.008
Elaine Jones		8:07:00	8:09:22	*	*
Nicholas Duncan		15:29:38	15:33:40	**	-
Mobil Leader	5/18/89	9:39:47	9:41:21	-	0.135, 0.050
Reliance		12:16:45	12:19:13	0.555, 0.054	0.120, **
Cooperative Vanguard		12:41:49	12:44:03	-0.429, -0.104	-0.062, -0.051
Marvin Norman		13:09:20	13:11:27	0.265, 0.030	0.127, 0.040
Illini		14:31:36	14:33:34	-0.235, -0.065	-
Thurston B. Morton	5/19/89	10:37:56	10:40:40	-	*
Clarence G. Frame		10:45:36	10:47:40	-	-0.028, 0.000

- Meter was not available
* Meter did not work

Kampsville Site, Trip 1

Tow name	Date	Passing time: Beginning	Passing time: Ending	Induced velocity m/s MMB511/1001 U_{im}, V_{im}	MMB511/998 U_{im}, V_{im}	MMB511/999 U_{im}, V_{im}	MMB511/1000 U_{im}, V_{im}	MMB511/642 U_{im}, V_{im}
Mr. Aldo	10/12/90	13:34:46	13:36:48	*	0.037, N/A	0.079,-0.042	0.250, 0.152	0.101, 0.028
Floyd Blaske		13:47:57	13:50:10	*	0.448,-0.017	0.570,-0.037	0.619, 0.009	0.710, 0.027
Marvin Norman	10/13/90	09:31:13	09:34:45	0.281, **	0.408, **	0.442, **	*	0.540, **
Luke Burton		09:55:32	09:56:38	0.432, **	0.506,-0.022	0.550,-0.035	0.712, 0.012	0.708,-0.027
Sugarland		09:58:35	10:01:18	0.381, **	0.494,-0.030	0.540,-0.040	0.660,-0.004	0.701, 0.061
William C. Norman		11:08:41	11:10:15	0.033, 0.014	0.080, 0.032	0.108, 0.006	0.194, 0.070	0.170, 0.072
Frank H. Peavey		15:20:29	15:24:20	0.380, 0.025	0.490, 0.044	0.540, 0.034	0.580, 0.041	0.665, 0.052
Conti Karla		16:23:56	16:27:38	0.435,-0.029	0.503,-0.025	0.607,-0.021	0.664,-0.022	0.704, 0.077
Mr. Paul	10/14/90	10:17:12	10:18:58	0.080, **	0.181, 0.002	0.239, **	0.366, 0.057	0.210, **
Rambler		10:56:37	10:58:25	0.075, **	0.167, **	0.204, N/A	0.280, 0.014	0.240, 0.059
Mr. Lawrence		11:42:09	11:44:22	0.490, **	0.570, **	0.665,-0.010	0.765, **	0.745, 0.074
Mallard		12:25:38	12:26:51	0.352, **	0.419, **	0.558, N/A	0.618, **	0.624, **
Charles Lehman		13:28:18	13:31:24	0.438,-0.030	0.534, 0.002	0.685, **	0.791, 0.004	0.767, 0.074
Nicholas Duncan		15:29:11	15:31:36	0.430, **	0.373,-0.014	0.550, 0.005	0.695, 0.007	0.682, 0.075
Jeff Boat		15:57:43	16:00:46	0.476,-0.033	0.455, 0.012	0.650, **	0.798,-0.011	0.779, 0.075
Mary Ann		16:36:20	16:39:11	0.292, **	0.299, **	0.489, **	0.615, **	0.549, **
Ardyce Randall	10/15/90	09:49:07	09:51:32	0.120, **	*	*	*	0.231, 0.155
Mr. Paul		12:07:21	12:09:53	0.441,-0.024	0.610, **	0.639, 0.009	*	0.740, 0.075
Exxon St. Louis		14:51:40	14:53:18	0.441, **	0.602, **	0.662,-0.012	0.843,-0.035	0.725, 0.082
Margaret O.		15:11:17	15:12:29	-0.070, **	0.042, **	0.075, **	0.258, **	0.127, **
Mr. Lawrence		18:10:53	18:12:36	-0.007, **	0.055, 0.004	0.091, 0.005	0.197, **	0.119, 0.066
A.L. Smith	10/16/90	10:27:27	10:29:00	0.178, **	0.279, **	0.334, **	0.658, **	0.321, **
Ste. Genevieve		16:19:41	16:22:00	0.348,-0.025	0.484, **	0.570, **	0.843, **	0.637, 0.055
Nicole Brent	10/17/90	10:25:21	10:26:31	0.355, **	0.557, **	0.475, **	*	0.663, 0.059
Frank H. Peavey		11:14:06	11:15:20	0.090, 0.025	0.330, **	0.238, **	*	0.315, 0.045

* Meter did not work
**No obvious impact

Kampsville Site, Trip 1 (Concluded)

Tow name	*Date*	*Passing time*		*Induced velocity m/s*		
				MMB511/332	*MMB527/040*	*MMB527/071*
		Beginning	*Ending*	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Mr. Aldo	10/12/90	13:34:46	13:36:48	0.180, 0.070	0.209, 0.101	0.240, 0.034
Floyd Blaske		13:47:57	13:50:10	0.847, 0.046	0.760, 0.089	0.750, 0.060
Marvin Norman	10/13/90	09:31:13	09:34:45	0.665, **	*	0.497, **
Luke Burton		09:55:32	09:56:38	0.803, 0.065	*	0.612, **
Sugarland		09:58:35	10:01:18	0.837, 0.065	*	0.631, **
William C. Norman		11:08:41	11:10:15	0.263, 0.072	0.235, 0.165	0.229, 0.070
Frank H. Peavey		15:20:29	15:24:20	0.782, 0.064	0.793, 0.187	0.697, 0.054
Conti Karla		16:23:56	16:27:38	0.810, 0.071	0.720, 0.160	0.708, 0.047
Mr. Paul	10/14/90	10:17:12	10:18:58	0.310, 0.025	*	0.303, 0.038
Rambler		10:56:37	10:58:25	0.320, 0.450	0.278, 0.140	*
Mr. Lawrence		11:42:09	11:44:22	0.900, 0.050	0.740, 0.145	0.690, 0.037
Mallard		12:25:38	12:26:51	0.704, 0.026	0.687, 0.159	0.577, 0.052
Charles Lehman		13:28:18	13:31:24	0.870, 0.050	0.800, 0.161	0.700, 0.061
Nicholas Duncan		15:29:11	15:31:36	0.830, 0.044	0.741, 0.163	0.640, 0.068
Jeff Boat		15:57:43	16:00:46	0.895, 0.074	0.765, 0.155	0.735, 0.067
Mary Ann		16:36:20	16:39:11	0.663, **	0.568, 0.081	0.585, 0.040
Ardyce Randall	10/15/90	09:49:07	09:51:32	0.380, 0.067	0.298, 0.158	0.345, 0.024
Mr. Paul		12:07:21	12:09:53	0.845, 0.099	0.728, 0.118	0.659, 0.034
Exxon St. Louis		14:51:40	14:53:18	0.924, 0.092	0.817, 0.258	*
Margaret O.		15:11:17	15:12:29	0.113,-0.170	-0.031,0.180	0.180, 0.058
Mr. Lawrence		18:10:53	18:12:36	0.201, 0.070	*	*
A.L. Smith	10/16/90	10:27:27	10:29:00	0.455, **	0.338, **	0.421, **
Ste. Genevieve		16:19:41	16:22:00	0.680, 0.022	0.590, 0.060	0.538, **
Nicole Brent	10/17/90	10:25:21	10:26:31	0.681, 0.030	0.690, 0.093	0.605, 0.040
Frank H. Peavey		11:14:06	11:15:20	0.240, 0.035	0.158, 0.144	0.277, 0.052

* Meter did not work
** No obvious impact

Kampsville Site, Trip 2

Tow name	Date	Passing Time		Induced velocity m/s		
				MMB511/1001	MMB511/998	MMB511/999
		Beginning	Ending	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Ranger	8/13/91	10:08:48	10:10:32	*	*	0.047,-0.012
Dixie Patriot		10:48:40	10:50:01	*	0.002, **	-0.120, **
Orleanian		16:39:53	16:42:40	0.261, **	*	0.361, **
Pat Breen		17:45:36	17:47:58	-0.107, **	*	-0.109,-0.006
Dixie Express		18:15:23	18:16:04	-0.059,0.085	*	-0.031,-0.020
Night-14-01	8/14/91	04:21:06	04:23:57	0.329, **	*	0.342, **
Night-14-02		07:15:57	07:16:51	-0.005,0.029	*	0.035,-0.009
Irving Crown		10:08:34	10:10:45	0.236, **	0.185, N/A	0.389, **
George W. Shamblin		13:16:16	13:16:56	0.039, **	*	0.058, **
Katherine L.		13:26:36	13:27:20	0.008, 0.026	0.121, **	0.075, **
Thruston B. Morton		14:21:58	14:23:57	0.306, **	*	0.393, **
Julie White		14:32:12	14:35:45	0.182, 0.016	*	0.272, **
Ranger		17:07:52	17:08:16	0.156, 0.011	*	**, **
Illini		19:12:43	19:14:43	0.165, **	*	0.197, **
Bronwynne Brent		19:23:50	19:25:19	-0.051, **	*	-0.008,0.004
Bill McCormick	8/15/91	00:02:15	00:04:28	-0.151,0.021	*	*
Marvin E. Norman		03:27:22	03:29:18	-0.082,0.018	*	*
Olmstead		13:02:42	13:05:16	0.362, **	0.273,-0.100	0.478, **
Jack D. Wofford		13:39:18	13:41:57	0.375, **	0.286, **	0.461,-0.065
Dixie Express		15:09:12	15:10:08	0.251, **	0.200, **	0.291, **
Hal D. Miller		17:45:56	17:46:56	-0.129,0.081	-0.100, **	-0.086, **
Jesse Brent		18:10:31	18:10:55	-0.029,0.080	0.001,-0.015	0.027,-0.044

* Meter did not work
**No obvious impact

Kampsville Site, Trip 2 (Concluded)

Tow name	Date	Passing Time		Induced velocity m/s		
				MMB511/1000	MMB527/642	MMB527/332
		Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Ranger	8/13/91	10:08:48	10:10:32	*	0.002, N/A	0.051, 0.030
Dixie Patriot		10:48:40	10:50:01	0.293, **	-0.071,0.036	-0.128,0.029
Orleanian		16:39:53	16:42:40	*	0.362, 0.015	0.393, 0.081
Pat Breen		17:45:36	17:47:58	*	-0.113, **	-0.090,0.051
Dixie Express		18:15:23	18:16:04	*	-0.027,0.022	-0.009,0.020
Night-14-01	8/14/91	04:21:06	04:23:57	*	0.375, **	0.407, 0.091
Night-14-02		07:15:57	07:16:51	*	0.032, **	0.061, 0.017
Irving Crown		10:08:34	10:10:45	*	0.338, 0.073	0.340, 0.047
George W. Shamblin		13:16:16	13:16:56	*	*	0.066, 0.024
Katherine L.		13:26:36	13:27:20	**, **	*	0.075, 0.023
Thruston B. Morton		14:21:58	14:23:57	*	*	0.450, 0.101
Julie White		14:32:12	14:35:45	*	*	0.336, 0.050
Ranger		17:07:52	17:08:16	*	*	**, **
Illini		19:12:43	19:14:43	**, **	*	0.251, 0.051
Bronwynne Brent		19:23:50	19:25:19	**, **	*	-0.002,0.029
Bill McCormick	8/15/91	02:12:55	04:28:20	*	*	-0.125,0.046
Marvin E. Norman		03:27:22	03:29:18	*	*	-0.039,0.063
Olmstead		13:02:42	13:05:16	0.085, **	*	0.503, 0.123
Jack D. Wofford		13:39:18	13:41:57	*	*	0.500, 0.108
Dixie Express		15:09:12	15:10:08	*	0.301, 0.010	0.371, 0.069
Hal D. Miller		17:45:56	17:46:56	*	-0.076,0.020	-0.088,0.045
Jesse Brent		18:10:31	18:10:55	*	0.021, 0.037	0.030, 0.029

* Meter did not work
**No obvious impact

Apple River Island Site

Tow name	Date	Passing Time		Induced velocity m/s				
				MMB511/1001	MMB511/1000	MMB511/998	MMB527/642	MMB527/332
		Beginning	Ending	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Yazoo	5/18/90	16:20:16	16:23:41	0.307, 0.005	0.343, -0.037	0.523, 0.089	**	0.193, 0.011
Cooperative Ambassador		16:46:42	16:48:55	0.451, -0.040	0.412, -0.056	*	0.464, 0.011	0.267, 0.012
Christine Bailey		17:21:24	17:23:17	0.123, -0.025	0.168, -0.030	*	0.185, -0.016	0.071, **
Kathy Ellen		20:07:30	20:09:39	0.317, 0.006	0.330, -0.014	*	0.329, 0.011	0.241, 0.010
W.A. Kernan	5/19/90	10:04:10	10:07:04	0.332, 0.008	0.342, -0.035	0.379, 0.092	0.291, 0.040	**
Hornet		11:20:37	11:21:31	0.156, -0.015	0.193, -0.030	0.337, -0.051	**	0.046, -0.021
Conti-Bonnie		11:40:41	11:42:25	0.312, 0.020	0.304, -0.002	0.417, 0.054	**	0.156, **
Becky Lynn		11:56:12	11:58:03	0.301, 0.012	0.300, -0.012	0.428, 0.076	0.268, 0.006	**
Merlin Banta	5/20/90	09:09:21	09:10:12	0.189, -0.006	0.192, -0.005	*	0.090, 0.052	0.007, -0.026
Rusty Flowers		11:27:57	11:29:38	0.299, 0.030	0.328, -0.011	0.441, 0.051	0.173, 0.069	*
Tom Talbert		12:36:12	12:37:48	0.320, 0.016	0.338, -0.041	**	**	*
Herman Pott		15:33:19	15:35:31	0.453, **	0.391, -0.014	0.462, 0.149	0.113, 0.193	*
Walter Brunson	5/21/90	10:06:14	10:08:09	0.308, 0.008	0.323, -0.011	*	**	0.529, 0.053
Dell Butcher		11:00:40	11:02:30	0.131, 0.019	0.182, **	**	0.349, -0.051	0.298, -0.046
Mary Gail		14:19:17	14:20:01	0.306, 0.019	0.288, -0.010	**	**	0.421, 0.016
T.S. Kunsman		14:37:15	14:38:33	0.151, -0.016	0.152, -0.026	**	0.357, -0.061	0.314, -0.055
D. Ray Miller		14:55:21	14:57:23	0.400, 0.002	0.352, **	0.528, 0.149	0.718, 0.085	0.570, **
Mary Gail	5/22/90	10:09:50	10:10:25	0.153, **	0.221, -0.029	*	0.386, -0.046	0.266, -0.036
Trojan		17:08:42	17:09:52	0.180, -0.019	0.191, -0.002	**	0.381, -0.050	0.269, -0.060
Melinda Brent		17:28:40	17:29:27	**	**	**	**	0.431, -0.053
Corporative Mariner		18:06:22	18:07:30	0.141, -0.045	0.130, -0.035	*	0.316, 0.019	0.182, -0.051
Ed Renshaw			19:49:48	-	-	-	-	-
Kevin Michael	5/23/90	06:52:42	06:55:13	-	-	-	-	-
Jack D. Wofford		16:13:23	16:14:20	0.320, 0.026	0.263, **	**	**	0.359, 0.021
Trojan		16:23:20	16:24:42	0.287, 0.014	**	**	**	**

- Meter was not available
* Meter did not work
**No obvious impact

Apple River Island Site (Concluded)

Tow name	Date	Passing Time Beginning	Passing Time Ending	Induced velocity m/s: MMB511/999 U_{im}, V_{im}	S4/071 U_{im}, V_{im}	S4/040 U_{im}, V_{im}
Yazoo	5/18/90	16:20:16	16:23:41	*	-	-
Cooperative Ambassador		16:46:42	16:48:55	*	-	-
Christine Bailey		17:21:24	17:23:17	*	-	-
Kathy Ellen		20:07:30	20:09:39	*	-	-
W.A. Kernan	5/19/90	10:04:10	10:07:04	*	**	-
Hornet		11:20:37	11:21:31	*	**	-
Conti-Bonnie		11:40:41	11:42:25	*	0.754, -0.029	-
Becky Lynn		11:56:12	11:58:03	*	**	-
Merlin Banta	5/20/90	09:09:21	09:10:12	*	-	**
Rusty Flowers		11:27:57	11:29:38	*	-	*
Tom Talbert		12:36:12	12:37:48	*	-	0.751, 0.080
Herman Pott		15:33:19	15:35:31	*	0.964, 0.100	*
Walter Brunson	5/21/90	10:06:14	10:08:09	*	0.698, -0.046	*
Dell Butcher		11:00:40	11:02:30	*	0.372, -0.010	*
Mary Gail		14:19:17	14:20:01	*	-	**
T.S. Kunsman		14:37:15	14:38:33	*	0.392, -0.036	0.267, 0.039
D. Ray Miller		14:55:21	14:57:23	*	0.726, -0.009	0.775, -0.004
Mary Gail	5/22/90	10:09:50	10:10:25	*	0.458, -0.140	**
Trojan		17:08:42	17:09:52	*	0.494, -0.021	0.481, -0.016
Merlinda Brent		17:28:40	17:29:27	*	**	*
Corporate Mariner		18:06:22	18:07:30	*	0.401, -0.046	*
Ed Renshaw			19:49:48	*	*	0.804, -0.020
Kevin Michael	5/23/90	06:52:42	06:55:13	*	-	**
Jack D. Wofford		16:13:23	16:14:20	*	-	**
Trojan		16:23:20	16:24:42	*	-	-

- Meter was not available
* Meter did not work
**No obvious impact

Goose Island Site, Trip 1

Tow name	Date	Passing Time		Induced velocity m/s				
				MMB511/1001	MMB511/998	MMB511/999	MMB511/1000	MMB527/642
		Beginning	Ending	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Sierra Dawn	8/24/90	10:51:08	10:52:54	0.297, 0.050	0.353, -0.015	0.397, -0.021	0.241, -0.006	0.289, -0.055
Dell Butcher		13:42:01	13:43:52	0.317, **	0.321, **	0.362, **	0.242, **	0.292, -0.056
William C. Norman		13:54:34	13:57:35	**	0.446, **	0.478, -0.010	0.314, 0.010	0.468, 0.013
Normania		14:16:33	14:20:50	0.532, 0.081	0.425, **	0.468, -0.010	0.320, **	0.451, 0.046
Dave Carlton		16:39:17	16:40:57	0.316, **	0.318, **	0.346, -0.036	0.204, -0.025	*
Hugh C. Blaske	8/25/90	11:19:46	11:22:52	0.657, 0.200	0.488, **	0.578, -0.010	0.371, 0.006	0.679, 0.034
Teresa Renee B.		12:15:45	12:17:17	0.248, -0.070	0.271, **	0.334, -0.036	0.198, -0.029	0.328, -0.035
Trojan Warrior		12:24:48	12:26:28	0.578, 0.150	0.457, **	0.568, -0.009	0.372, -0.030	0.681, **
Hoosier State		15:45:01	15:47:01	0.522, 0.142	0.416, **	0.469, -0.010	0.316, 0.025	0.614, 0.045
Kevin Michael	8/26/90	11:46:36	11:48:36	-	0.331, **	0.412, **	0.229, -0.014	-
Sumac		13:27:02	13:27:21	-	0.317, -0.024	0.370, 0.001	0.212, -0.038	-
Twin City		14:21:22	14:24:00	-	0.428, **	0.528, **	0.343, 0.020	-
Cooperative Vangard		14:58:35	15:01:11	-	**	0.501, 0.020	0.305, 0.020	-
Superior	8/27/90	9:54:38	9:58:22	-	0.474, -0.009	**	*	-
Helen M. Clements		12:36:11	12:38:32	-	**	**	0.325, **	-

- Meter was not available
* Meter did not work
** No obvious impact

Goose Island Site, Trip 1 (Concluded)

Tow name	Date	Passing Time		Induced velocity m/s		
				MMB527/332	S4/071	S4/040
		Beginning	Ending	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Sierra Dawn	8/24/90	10:51:08	10:52:54	0.291, -0.034	0.348, -0.058	**
Dell Butcher		13:42:01	13:43:52	0.341, -0.056	0.100, -0.100	0.261, 0.011
William C. Norman		13:54:34	13:57:35	0.447, 0.090	0.589, 0.008	0.651, 0.178
Normania		14:16:33	14:20:50	0.381, 0.056	*	0.673, 0.201
Dave Carlton		16:39:17	16:40:57	0.150, **	0.294, -0.052	-
Hugh C. Blaske	8/25/90	11:19:46	11:22:52	0.248, 0.024	0.627, 0.079	0.767, 0.218
Teresa Renee B.		12:15:45	12:17:17	0.056, **	*	**
Trojan Warrior		12:24:48	12:26:28	0.163, 0.006	0.707, -0.007	0.714, 0.218
Hoosier State		15:45:01	15:47:01	0.307, 0.024	**	0.681, 0.112
Kevin Michael	8/26/90	11:46:36	11:48:36	-	*	**
Sumac		13:27:02	13:27:21	-	*	0.218, -0.019
Twin City		14:21:22	14:24:00	-	-	**
Cooperative Vangard		14:58:35	15:01:11	-	-	**
Superior	8/27/90	9:54:38	9:58:22	-	-	-
Helen M. Clements		12:36:11	12:38:32	-	-	-

- Meter was not available
* Meter did not work
** No obvious impact

Goose Island Site, Trip 2

Tow name	*Date*	*Passing Time*		*Induced velocity m/s*				
				MMB511/1001	*MMB511/1130*	*MMB511/1131*	*MMB511/998*	*MMB511/999*
		Beginning	*Ending*	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Ardyce Randall	7/18/91	10:42:18	10:44:10	**	0.036, -0.017	0.010, -0.014	**	-0.041, 0.036
Scarlet Knight		12:26:59	12:28:46	0.245, -0.026	**	**	**	-0.007, -0.10
James F. Neal		14:17:04	14:18:34	0.208, -0.027	0.104, **	0.181, -0.011	**	-0.008, 0.002
Helen M. Clements		17:23:03	17:25:22	**	**	**	**	0.069, -0.007
Elizabeth Ann		18:00:59	18:02:46	-	-	-	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	**	0.094, 0.001	0.157, -0.005	**	-0.030, 0.011
Queen City		14:33:45	14:35:21	0.202, **	0.078, -0.003	0.129, 0.014	**	*
Helen M. Clements		16:24:27	16:26:12	0.194, -0.010	0.081, 0.001	0.133, **	*	**
Frank T.Heffelfinger		16:33:21	16:36:52	0.327, 0.005	**	**	*	0.036, **
Cooperative Venture		18:05:37	18:56:45	**	**	**	*	*
Volunteer State		08:09:31	08:11:39	0.195, **	0.061, 0.013	0.094, -0.006	-	-
Prairie Dawn	7/20/91	08:19:27	08:22:28	-	-	-	-	-0.02, -0.020
Prosperity		11:39:19	11:40:55	-	-	-	-	**
Clyde Butcher		11:55:54	11:56:27	-	-	-	-	-
Lil Charley		13:31:19	13:31:38	-	-	-	-	-
C.W. Rushing		16:56:41	16:59:16	*	0.099, 0.001	0.186, -0.001	-	-0.007, 0.041
Conti-Nan		16:56:41	16:59:16	0.331, 0.021	0.297, 0.025	0.256, 0.011	*	*
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	0.338, 0.016	0.274, 0.006	0.303, 0.010	**	**
Conti-Karla		14:57:38	14:59:13	0.188, -0.016	0.140, **	0.168, 0.025	**	-0.028, -0.034
Cooperative Mariner	7/22/91	10:34:47	10:36:47	**	**	**	-0.034, -0.011	0.020, -0.000
Hornet		12:11:57	12:13:47	0.181, 0.025	**	0.165, 0.024	-0.046, 0.020	**
Cooperative Ambassador		13:16:41	13:18:43	0.318, 0.035	0.283, -0.030	0.312, 0.016	0.091, -0.021	0.161, 0.041
Eastern		13:20:30	13:23:42	**	**	**	**	**
Sam M. Fleming		13:24:11	13:25:52	0.319, 0.044	0.311, 0.041	0.322, -0.025	0.108, 0.002	0.211, **
Kevin Michael		14:00:12	14:02:12	0.203, 0.028	0.146, -0.005	0.170, 0.026	*	*
A.M. Thompson	7/23/91	14:12:24	14:14:23	**	0.130, 0.021	0.140, -0.011	*	**
Lil Charley		14:20:30	14:20:55	0.311, **	0.265, -0.019	0.289, 0.031	*	0.221, 0.004
Badger		15:55:55	15:57:30	0.203, -0.006	0.136, -0.015	0.171, -0.020	*	0.011, -0.017
Kay D		15:59:29	16:00:13	0.226, 0.036	0.141, 0.012	0.188, -0.005	*	**
Evey-T		16:24:21	16:26:55	0.308, 0.002	**	0.293, 0.031	*	*
G.R. Packet	7/24/91	8:25:25	8:28:39	0.591, -0.200	0.303, 0.002	0.270, 0.021	0.106, -0.031	**
Mary L.		9:14:50	9:17:21	**	**	**	**	0.220, -0.010
Dud Hollinger		9:58:51	10:02:05	**	**	**	**	**
C.W. Rushing		12:13:19	12:13:57	**	**	**	**	**
Dell Butcher		13:44:39	13:46:27	0.312, -0.157	0.169, -0.025	**	**	**
Coral Dawn		14:48:44	14:51:19	0.524, -0.200	0.291, **	**	0.073, -0.023	**
Teresa R. Beesecker		15:43:33	15:45:33	**	**	0.282, 0.021	**	**

Goose Island Site, Trip 2 (Continued)

		Passing Time		Induced velocity m/s				
				MMB511/1000	MMB527/642	MMB527/332	S4/071	S4/151
Tow name	Date	Beginning	Ending	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
Ardyce Randall	7/18/911	10:42:18	10:44:10	0.000, -0.021	0.347, -0.040	0.363, -0.045	-	-0.184, -0.021
Scarlet Knight		12:26:59	12:28:46	-0.021, **	0.348, -0.034	0.367, -0.020	-	-
James F. Neal		14:17:04	14:18:34	-0.027, **	0.319, -0.025	0.302, **	0.501, -0.028	**
Helen M. Clements		17:23:03	17:25:22	0.074, -0.006	0.642, 0.040	0.665, -0.045	-	*
Elizabeth Ann		18:00:59	18:02:46	-	**	**	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	-0.021, 0.025	0.292, -0.041	0.517, -0.051	-	-
Queen City		14:33:45	14:35:21	-0.019, **	0.290, 0.012	0.421, -0.065	*	-
Helen M. Clements		16:24:27	16:26:12	**	0.239, -0.036	**	0.462, -0.032	-
Frank T.Heffelfinger		16:33:21	16:36:52	0.130, -0.049	0.553, 0.010	0.793, 0.000	0.745, 0.495	-
Cooperative Venture		18:05:37	18:56:45	0.102, -0.026	-	-	-	-
Volunteer State		08:09:31	08:11:39	-	-	-	-	-
Prairie Dawn	7/20/91	08:19:27	08:22:28	-0.040, **	-	-	-	0.419, 0.001
Prosperity		11:39:19	11:40:55	0.082, -0.019	0.569, -0.014	**	-	0.846, 0.238
Clyde Butcher		11:55:54	11:56:27	-	0.279, -0.050	**	-	0.541, 0.192
Lil Charley		13:31:19	13:31:38	-	**	0.422, -0.066	-	0.552, 0.091
C.W. Rushing		16:56:41	16:59:16	-0.019, 0.029	0.292, -0.051	**	-	**
Conti-Nan		16:56:41	16:59:16	0.078, -0.030	0.580, 0.001	0.589, -0.009	-	0.837, 0.271
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	**	**	**	0.631, 0.046	**
Conti-Karla		14:57:38	14:59:13	*	0.228, **	0.401, -0.040	0.331, -0.033	**
Cooperative Mariner	7/22/91	10:34:47	10:36:47	0.022, 0.021	0.283, -0.051	**	-	**
Hornet		12:11:57	12:13:47	0.010, -0.056	0.313, **	0.316, -0.065	0.396, **	0.429, -0.015
Cooperative Ambassador		13:16:41	13:18:43	0.169, -0.046	**	0.587, **	0.597, 0.037	**
Eastern		13:20:30	13:23:42	**	0.501, 0.081	0.572, **	**	0.690, **
Sam M. Fleming		13:24:11	13:25:52	0.213, **	0.587, 0.046	0.659, 0.090	0.671, 0.066	0.820, 0.230
Kevin Michael		14:00:12	14:02:12	*	0.291, -0.040	0.291, **	0.398, 0.001	0.450, -0.002
A.M. Thompson	7/23/91	14:12:24	14:14:23	**	0.296, **	**	0.410, 0.090	**
Lil Charley		14:20:30	14:20:55	0.209, -0.050	0.559, 0.003	0.618, -0.011	0.631, 0.095	0.764, 0.228
Badger		15:55:55	15:57:30	0.001, -0.033	0.342, -0.056	0.320, 0.015	0.388, 0.101	0.355, 0.019
Kay D		15:59:29	16:00:13	**	**	**	**	**
Evey-T		16:24:21	16:26:55	*	0.562, 0.012	**	**	**
G.R. Packet	7/24/91	8:25:25	8:28:39	**	**	**	-	0.792, -0.051
Mary L.		9:14:50	9:17:21	**	**	**	-	0.699, 0.154
Dud Hollinger		9:58:51	10:02:05	0.189, -0.050	*	**	**	**
C.W. Rushing		12:13:19	12:13:57	**	**	**	0.552, 0.071	**
Dell Butcher		13:44:39	13:46:27	**	0.191, -0.010	0.107, -0.019	0.420, 0.101	**
Coral Dawn		14:48:44	14:51:19	*	0.386, -0.006	**	**	**
Teresa R. Beesecker		15:43:33	15:45:33	**	**	**	0.635, 0.090	**

Goose Island Site, Trip 2 (Concluded)

Tow name	*Date*	*Passing Time*		*Induced velocity m/s*		
				S4/040	*S4/832*	*S4/834*
		Beginning	*Ending*	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
Ardyce Randall	7/18/911	10:42:18	10:44:10	-	**	0.508, 0.093
Scarlet Knight		12:26:59	12:28:46	-	-0.037, -0.043	**
James F. Neal		14:17:04	14:18:34	0.435, -0.008	-	0.259, 0.400
Helen M. Clements		17:23:03	17:25:22	**	-	**
Elizabeth Ann		18:00:59	18:02:46	-	-	-
Frank T. Heffelfinger	7/19/91	11:03:32	11:05:24	-	-	**
Queen City		14:33:45	14:35:21	-	-	0.440, -0.059
Helen M. Clements		16:24:27	16:26:12	-	-	0.512, -0.068
Frank T.Heffelfinger		16:33:21	16:36:52	-	-	0.899, 0.139
Cooperative Venture		18:05:37	18:56:45	-	-	0.857, 0.055
Volunteer State		08:09:31	08:11:39	-	-	-
Prairie Dawn	7/20/91	08:19:27	08:22:28	-	-	**
Prosperity		11:39:19	11:40:55	-	-	0.809, 0.103
Clyde Butcher		11:55:54	11:56:27	-	0.470, -0.039	0.573, 0.056
Lil Charley		13:31:19	13:31:38	-	**	**
C.W. Rushing		16:56:41	16:59:16	-	**	0.558, 0.040
Conti-Nan		16:56:41	16:59:16	-	0.900, 0.139	0.849, 0.100
Cooperative Vanguard	7/21/91	13:08:36	13:11:50	0.912, 0.318	**	0.797, 0.102
Conti-Karla		14:57:38	14:59:13	0.393, 0.000	0.391, 0.103	0.481, -0.060
Cooperative Mariner	7/22/91	10:34:47	10:36:47	0.436, 0.080	**	0.440, 0.102
Hornet		12:11:57	12:13:47	0.450, 0.261	**	0.449, 0.102
Cooperative Ambassador		13:16:41	13:18:43	0.779, 0.219	0.808, 0.142	0.726, **
Eastern		13:20:30	13:23:42	**	0.771, 0.089	**
Sam M. Fleming		13:24:11	13:25:52	0.790, 0.169	0.838, 0.110	0.818, 0.109
Kevin Michael		14:00:12	14:02:12	**	**	**
A.M. Thompson	7/23/91	14:12:24	14:14:23	**	**	0.501, 0.081
Lil Charley		14:20:30	14:20:55	**	**	0.791, 0.091
Badger		15:55:55	15:57:30	0.468, 0.011	0.411, 0.009	0.470, -0.035
Kay D		15:59:29	16:00:13	0.514, 0.129	**	0.541, 0.002
Evey-T		16:24:21	16:26:55	0.882, 0.160	**	0.702, 0.056
G.R. Packet	7/24/91	8:25:25	8:28:39	**	0.803, 0.062	0.740, 0.068
Mary L.		9:14:50	9:17:21	0.682, 0.136	**	-
Dud Hollinger		9:58:51	10:02:05	0.718, 0.030	0.747, **	-
C.W. Rushing		12:13:19	12:13:57	0.711, 0.269	**	-
Dell Butcher		13:44:39	13:46:27	**	**	-
Coral Dawn		14:48:44	14:51:19	0.760, 0.112	**	-
Teresa R. Beesecker		15:43:33	15:45:33	**	**	-

Clarks Ferry Site, Trip 1

Tow name	Date	Passing time		Induced velocity m/s				
		Beginning	Ending	MMB511/1001 U_{im} V_{im}	MMB511/1130 U_{im} V_{im}	MMB511/1131 U_{im} V_{im}	MMB511/998 U_{im} V_{im}	MMB511/999 U_{im} V_{im}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	*	**	**	0.646,0.046	*
Donnie Ray Jr. 1		12:22:50	12:24:30	*	0.250,-0.031	0.280,-0.037	0.261,0.042	*
Samantha		13:26:43	13:27:06	*	0.136,-0.016	**	**	**
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	0.027,-0.001	**	**	**	0.248,-0.015
Jemco Towing		15:03:40	15:04:39	0.180, 0.029	0.291, 0.022	0.312, 0.013	0.387,-0.002	0.401,-0.006
T.S. Kunsman		16:31:55	16:33:22	*	0.130,-0.009	0.178,-0.006	0.183,-0.037	0.224,-0.031
Dell Butcher 1		17:43:27	17:46:12	0.206, 0.039	0.276, N/A	0.331, N/A	0.398,-0.017	0.431, 0.045
Pearl B.	5/19/91	10:06:30	10:07:53	-	-	-	-	-
Conti-Afton		11:41:08	11:42:35	-	-	-	-	-
Jack D. Wofford		16:33:57	16:35:16	**	**	**	**	**
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	**	**	**	**	**
Sunflower 1		12:24:22	12:24:37	**	0.159,-0.011	**	**	0.251,-0.037
American Beauty 1		15:48:23	15:50:13	**	**	**	**	**
Sierra Dawn	5/21/91	09:09:28	09:11:00	**	**	**	**	**
Cooperative Vanguard		09:36:54	09:37:56	**	**	**	**	**
Cindy J. Erickson		10:29:26	10:31:47	**	**	**	**	0.368, 0.005
Frank H. Peavy		10:49:16	10:50:37	**	**	**	0.140,-0.031	**
Helen M. Clements		11:32:51	11:34:43	0.202, 0.018	0.318, 0.036	0.348, 0.036	0.318, 0.006	0.426, 0.039
Sunflower 2		12:13:06	12:13:22	**	**	**	**	**
Dell Butcher 2		12:37:20	12:38:44	**	**	**	**	0.242,-0.034
Hornet		13:30:54	13:32:27	**	**	**	**	**
Volunteer State		16:08:16	16:09:56	**	**	**	**	**
Edward J. Hancock	5/22/91	09:52:51	09:55:33	*	0.278, 0.031	**	*	**
Starfire		10:54:32	10:56:51	0.178, 0.016	**	**	*	0.386, 0.009
American Beauty 2		13:46:39	13:47:10	**	**	**	**	0.258,-0.027

- Meter was not available
* Meter did not work
** No obvious impact

Clarks Ferry Site, Trip 1 (Continued)

		Passing time		Induced velocity m/s				
				MMB511/1000	MMB527/332	MMB527/642	S4/151	S4/834
Tow name	Date	Beginning	Ending	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	0.824,0.008	**	**	*	-
Donnie Ray Jr. 1		12:22:50	12:24:30	0.469,0.044	**	0.493,-0.064	*	-
Samantha		13:26:43	13:27:06	**	0.453,-0.052	**	*	-
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	**	0.341,-0.050	*	*	0.125, 0.023
Jemco Towing		15:03:40	15:04:39	0.444, 0.001	**	**	**	0.253, 0.145
T.S. Kunsman		16:31:55	16:33:22	0.271,-0.028	**	0.549,-0.027	*	**
Dell Butcher 1		17:43:27	17:46:12	0.449, 0.020	*	*	0.441,-0.085	**
Pearl B.	5/19/91	10:06:30	10:07:53	-	**	**	**	0.143, 0.068
Conti-Afton		11:41:08	11:42:35	-	**	**	**	0.143, 0.054
Jack D. Wofford		16:33:57	16:35:16	**	**	**	0.132,-0.059	**
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	**	0.581, 0.058	**	*	*
Sunflower 1		12:24:22	12:24:37	**	**	**	*	*
American Beauty 1		15:48:23	15:50:13	**	**	**	*	0.434, 0.198
Sierra Dawn	5/21/91	09:09:28	09:11:00	**	-	-	*	*
Cooperative Vanguard		09:36:54	09:37:56	**	-	-	-	*
Cindy J. Erickson		10:29:26	10:31:47	0.399, 0.014	-	-	-	*
Frank H. Peavy		10:49:16	10:50:37	**	-	-	-	*
Helen M. Clements		11:32:51	11:34:43	0.439, 0.059	-	-	-	-
Sunflower 2		12:13:06	12:13:22	**	-	-	-	-
Dell Butcher 2		12:37:20	12:38:44	0.291,-0.034	-	-	-	-
Hornet		13:30:54	13:32:27	**	-	-	-	-
Volunteer State		16:08:16	16:09:56	0.406,-0.004	-	-	-	0.721, 0.077
Edward J. Hancock	5/22/91	09:52:51	09:55:33	**	-	-	-	0.737, 0.098
Starfire		10:54:32	10:56:51	**	-	-	-	0.799, 0.113
American Beauty 2		13:46:39	13:47:10	**	-	-	-	**

- Meter was not available
* Meter did not work
** No obvious impact

Clarks Ferry Site, Trip 1 (Concluded)

		Passing time		Induced velocity m/s		
				S4/040	S4/832	S4/071
Tow name	*Date*	*Beginning*	*Ending*	U_{im}, V_{im}	U_{im}, V_{im}	U_{im}, V_{im}
C.W. Rushing 1	5/16/91	12:07:44	12:08:56	-	**	-
Donnie Ray Jr. 1		12:22:50	12:24:30	-	**	-
Samantha		13:26:43	13:27:06	-	0.434,-0.042	-
C.W. Rushing 2	5/17/91	12:26:16	12:26:36	*	**	**
Jemco Towing		15:03:40	15:04:39	*	**	**
T.S. Kunsman		16:31:55	16:33:22	*	*	0.346,-0.084
Dell Butcher 1		17:43:27	17:46:12	*	0.314, 0.065	0.819, 0.151
Pearl B.	5/19/91	10:06:30	10:07:53	*	0.091,-0.085	-
Conti-Afton		11:41:08	11:42:35	*	0.107,-0.043	0.433, 0.010
Jack D. Wofford		16:33:57	16:35:16	**	0.192, 0.001	0.414,-0.041
Donnie Ray Jr. 2	5/20/91	11:33:41	11:36:31	0.887, 0.121	*	*
Sunflower 1		12:24:22	12:24:37	**	*	*
American Beauty 1		15:48:23	15:50:13	0.801, 0.081	**	*
Sierra Dawn	5/21/91	09:09:28	09:11:00	**	**	*
Cooperative Vanguard		09:36:54	09:37:56	0.484,-0.017	*	-
Cindy J. Erickson		10:29:26	10:31:47	**	0.385, 0.088	-
Frank H. Peavy		10:49:16	10:50:37	**	*	-
Helen M. Clements		11:32:51	11:34:43	0.758, 0.059	*	-
Sunflower 2		12:13:06	12:13:22	**	*	-
Dell Butcher 2		12:37:20	12:38:44	0.474,-0.008	*	-
Hornet		13:30:54	13:32:27	0.718, 0.044	*	-
Volunteer State		16:08:16	16:09:56	0.749, 0.067	*	**
Edward J. Hancock	5/22/91	09:52:51	09:55:33	0.708, 0.064	0.349, 0.009	**
Starfire		10:54:32	10:56:51	**	*	**
American Beauty 2		13:46:39	13:47:10	0.431,-0.064	**	**

- Meter was not available
* Meter did not work
** No obvious impact

Clarks Ferry Site, Trip 2

Tow name	Date	Passing time		Induced velocity m/s				
		Beginning	Ending	MMB511/1001	MMB511/998	MMB511/999	MMB511/1000	MMB511/1130
				U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}	U_{im} V_{im}
C.W. Rushing	10/17/91	07:33:54	07:34:17	**	0.062,-0.025	0.084,-0.022	0.104,-0.016	0.072, 0.000
Evey-T		08:43:43	08:45:34	0.095, 0.005	0.145, 0.002	0.171,-0.004	0.170, 0.011	0.182, 0.020
Sunflower 1		11:43:54	11:44:12	0.030,-0.011	0.064,-0.009	0.089,-0.014	0.118,-0.009	0.061, 0.001
Evelyn C.		11:45:01	11:45:36	0.033,-0.026	0.058,-0.011	0.095,-0.017	**	0.074, 0.008
Sunflower 2		17:06:09	17:06:35	0.070, N/A	0.121, 0.015	0.148, 0.015	0.158, 0.014	0.167, 0.016
Conti-Nan 1		18:54:59	18:57:14	0.011, N/A	0.034,-0.008	0.044,-0.005	0.064,-0.007	0.054,-0.019
Night 1		20:14:14	20:14:33	0.074, N/A	0.106, 0.013	0.125, 0.013	**	0.150, 0.007
Night 2		20:19:50	20:20:12	0.077, N/A	**	**	**	**
Night 3		20:50:43	20:51:25	0.036, N/A	**	**	0.097, 0.002	0.089,-0.016
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	0.029, N/A	0.060,-0.001	0.091,-0.002	**	0.079,-0.014
Lady Lone Star 2		07:43:37	07:43:44	0.063, N/A	**	**	**	**
Kevin Michael		08:24:59	08:27:08	0.018, N/A	0.029,-0.006	0.061,-0.011	0.070,-0.009	0.053,-0.019
Deborah Valentine		09:55:28	09:58:08	0.011, N/A	0.030,-0.012	0.046,-0.006	0.069, 0.000	0.060,-0.015
Volunteer State		10:06:34	10:07:14	-0.035, N/A	0.008,-0.011	0.026,-0.016	0.019,-0.011	0.043,-0.006
Sunflower 3		11:26:47	11:27:04	**	**	0.076,-0.002	**	**
Frank Stegbauer		12:32:08	12:32:52	-0.002, N/A	0.028,-0.016	0.059,-0.004	0.065, 0.006	0.055,-0.019
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.009, N/A	0.035, N/A	0.041,-0.005	0.075,-0.000	0.066,-0.014
Jack Bullard		12:07:14	12:09:42	0.169, 0.003	0.201, 0.016	0.208, N/A	0.228, N/A	0.228, 0.005
Marc		12:57:38	12:58:29	0.039,-0.012	0.040,-0.006	0.074,-0.016	0.083,-0.001	**
Conti-Nan 2		13:44:23	13:45:17	0.104, 0.001	0.131, 0.014	0.141, 0.009	0.151, 0.015	0.169, 0.007
Cristina Ecstein		14:03:17	14:04:18	0.094.-0.001	**	0.139, 0.010	0.140, 0.011	0.148, 0.006
Coast Guard 65504		14:54:46	14:54:57	0.055,-0.011	0.079,-0.001	**	0.101, 0.000	**
Prairie Dawn		17:30:03	17:31:27	0.118, 0.011	0.151, 0.016	0.166, 0.014	0.183, 0.016	0.191, 0.010
Noname	10/20/91	06:54:14	06:55:25	*	0.146, 0.014	0.164, N/A	0.169, 0.019	*
Cooperative Ambassador		07:05:14	07:07:29	0.002,-0.007	0.041, N/A	0.055,-0.010	0.076,-0.004	0.066,-0.012
Yazoo City		09:31:48	09:34:30	0.121, 0.015	0.146, 0.016	0.174, 0.026	0.183, N/A	0.191, 0.006
George W. Banta		12:19:36	12:21:59	0.099, 0.011	0.139, 0.014	0.154, N/A	0.161, N/A	0.154, 0.006

- Meter was not available
* Meter did not work
** No obvious impact

Clarks Ferry Site, Trip 2 (Continued)

Tow name	Date	Passing time		Induced velocity m/s			
		Beginning	Ending	MMB511/1131 U_{im} V_{im}	MMB527/332 U_{im} V_{im}	MMB527/642 U_{im} V_{im}	S4/834 U_{im} V_{im}
C.W. Rushing	10/17/91	07:33:54	07:34:17	0.092, 0.002	0.143,-0.036	0.144,-0.024	-
Evey-T		08:43:43	08:45:34	0.208, 0.016	0.348, 0.025	0.336, 0.011	-
Sunflower 1		11:43:54	11:44:12	0.096, 0.004	0.162,-0.011	**	*
Evelyn C.		11:45:01	11:45:36	0.098, 0.003	0.161, 0.009	0.178,-0.021	*
Sunflower 2		17:06:09	17:06:35	0.178, 0.005	0.318, 0.014	0.341, 0.022	*
Conti-Nan 1		18:54:59	18:57:14	0.069,-0.025	0.112,-0.026	0.089,-0.051	0.241,-0.002
Night 1		20:14:14	20:14:33	0.159,-0.001	0.284, 0.016	0.278, 0.011	*
Night 2		20:19:50	20:20:12	**	**	0.274, 0.020	*
Night 3		20:50:43	20:51:25	0.111,-0.012	**	0.178,-0.072	*
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	0.105,-0.015	**	**	0.258.-0.024
Lady Lone Star 2		07:43:37	07:43:44	**	0.292, 0.014	**	*
Kevin Michael		08:24:59	08:27:08	0.059,-0.020	0.099,-0.029	0.123,-0.034	0.257,-0.055
Deborah Valentine		09:55:28	09:58:08	0.074,-0.011	0.108,-0.027	0.093,-0.049	**
Volunteer State		10:06:34	10:07:14	0.059,-0.010	0.032,-0.015	0.080,-0.016	0.207,-0.071
Sunflower 3		11:26:47	11:27:04	**	0.168,-0.020	0.191,-0.021	**
Frank Stegbauer		12:32:08	12:32:52	0.081,-0.014	0.128,-0.042	0.100,-0.020	*
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.076,-0.015	0.107,-0.031	0.163,-0.044	0.238,-0.068
Jack Bullard		12:07:14	12:09:42	0.238, 0.001	0.415, 0.016	0.483, 0.001	0.662, N/A
Marc		12:57:38	12:58:29	0.097,-0.016	**	0.126,-0.025	0.318,-0.025
Conti-Nan 2		13:44:23	13:45:17	0.174, 0.005	0.347, 0.021	0.324, 0.010	0.540, 0.088
Cristina Ecstein		14:03:17	14:04:18	0.166, 0.003	0.321, 0.031	0.321, 0.006	0.470, 0.032
Coast Guard 65504		14:54:46	14:54:57	**	0.173,-0.035	**	**
Prairie Dawn		17:30:03	17:31:27	0.202, 0.004	0.350, 0.043	0.363, 0.020	*
Noname	10/20/91	06:54:14	06:55:25	*	0.357, 0.032	*	0.542, 0.016
Cooperative		07:05:14	07:07:29	0.079.-0.014	0.123, 0.026	*	0.261,-0.049
Ambassador							
Yazoo City		09:31:48	09:34:30	0.203,-0.001	0.380, 0.030	0.381, 0.015	*
George W. Banta		12:19:36	12:21:59	0.176, 0.009	0.330, 0.016	0.329, 0.025	0.660,-0.068

- Meter was not available
* Meter did not work
** No obvious impact

Clarks Ferry Site, Trip 2 (Concluded)

Tow name	Date	Passing time		Induced velocity m/s		
		Beginning	Ending	S4/151 U_{im} V_{im}	S4/832 U_{im} V_{im}	S4/040 U_{im} V_{im}
C.W. Rushing	10/17/91	07:33:54	07:34:17	-	-	*
Evey-T		08:43:43	08:45:34	-	-	-
Sunflower 1		11:43:54	11:44:12	**	0.154,-0.011	*
Evelyn C.		11:45:01	11:45:36	0.223, 0.012	**	*
Sunflower 2		17:06:09	17:06:35	0.399, 0.107	0.371, 0.030	-
Conti-Nan 1		18:54:59	18:57:14	0.163, 0.206	0.123, 0.069	0.071,-0.036
Night 1		20:14:14	20:14:33	0.390, 0.098	0.327, 0.037	0.283, 0.010
Night 2		20:19:50	20:20:12	0.374, 0.088	0.350, 0.034	*
Night 3		20:50:43	20:51:25	**	**	0.047, 0.020
Lady Lone Star 1	10/18/91	07:16:51	07:17:25	**	**	*
Lady Lone Star 2		07:43:37	07:43:44	**	**	*
Kevin Michael		08:24:59	08:27:08	0.161, 0.196	0.101, 0.053	*
Deborah Valentine		09:55:28	09:58:08	0.184, 0.153	0.146, 0.057	*
Volunteer State		10:06:34	10:07:14	0.032, 0.181	0.061, 0.089	*
Sunflower 3		11:26:47	11:27:04	-	-	*
Frank Stegbauer		12:32:08	12:32:52	0.202,-0.066	0.143,-0.044	*
Kathy Ellen	10/19/91	10:13:44	10:16:43	0.212, 0.158	0.171, 0.059	*
Jack Bullard		12:07:14	12:09:42	0.626, 0.272	*	0.488, 0.075
Marc		12:57:38	12:58:29	0.208, 0.105	0.188, 0.031	*
Conti-Nan 2		13:44:23	13:45:17	0.432, 0.131	0.370, 0.045	*
Cristina Ecstein		14:03:17	14:04:18	0.359, 0.106	0.348, 0.050	*
Coast Guard 65504		14:54:46	14:54:57	**	0.196,-0.190	**
Prairie Dawn		17:30:03	17:31:27	0.446, 0.129	0.373, 0.046	0.252, 0.046
Noname	10/20/91	06:54:14	06:55:25	0.398, 0.107	0.372, 0.056	*
Cooperative Ambassador		07:05:14	07:07:29	0.158, 0.150	0.189, 0.061	*
Yazoo City		09:31:48	09:34:30	0.477, 0.147	0.404, 0.069	*
George W. Banta		12:19:36	12:21:59	0.623, 0.272	**	*

- Meter was not available
* Meter did not work
** No obvious impact

APPENDIX XII.

MAXIMUM WAVE HEIGHT AND DRAWDOWN AT ALL STUDY SITES AND FOR ALL BARGE-TOW EVENTS

McEver's Island Site

Name	*Date*	*Maximum* wave height (m)*	*Maximum* drawdown (m)*
R. W. Naye	5/16/89	0.03	-0.213
Evelyn C.			-0.091
Mary Ellen	5/17/89		-0.073
Elaine Jones		0.03	-0.17
Bill McCormick			-0.11
Nicolas Duncan		0.05	-0.05
Mobil Leader	5/18/89	0.07	-0.18
Reliance		0.14	-0.152
Cooperative Vanguard		0.15	-0.17
Marvin E. Norman		0.05	-0.082
Illini		0.06	-0.076
Thurston B. Morton	5/19/89	0.02	
Clarence G. Frame		0.01	-0.24

* taken from a staff gage reading

Preceding Page Blank

Kampsville Site, Trip 1

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Mallard	10/11/90	0.09*	-0.15*
Nicholas Duncan		0.04*	-0.03*
Bill Gee		0.3*	-0.122*
Mr. Aldo	10/12/90	0.061	-0.09
Floyd H. Blaske		0.092	-0.075
Marvin E. Norman	10/13/90	0.061	-0.029
Luke Burton		0.244	-0.107
Sugarland		0.092	-0.123
William C Norman		0.122	-0.09
Frank H. Peavey		0.13	-0.014
Conti Karla		0.107	-0.105
Margaret O.			-0.183*
Mr. Paul	10/14/90	0.06	-0.075
Rambler		0.076	-0.06
Mr. Lawrence		0.168	-0.121
Mallard		0.137	-0.06
Charles Lehman		0.106	-0.106
Nicholas Duncan		0.214	-0.09
Jeff Boat		0.061	-0.093
Mary Ann		0.091	-0.03
Ardyce Randall	10/15/90	0.061	-0.032
Mr. Paul		0.077	-0.077
Exxon St. Louis		0.077	-0.105
Margaret O.		0.107	-0.153
Mr. Lawrence		0.12*	-0.183*
A. L. Smith	10/16/90	0.122	-0.062
Ste. Genevieve		0.107	-0.063
Nicole Brent	10/17/90	0.229	-0.123
Frank H. Peavey		0.153	-0.108

*taken from a staff gage reading

Kampsville Site, Trip 2

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Ranger	08/13/91	0.01*	-0.012*
Dixie Patriot		0.153	-0.167
Orleanian		0.213	-0.077
Pat Breen		0.076	-0.105
Dixie Express II		0.091	-0.105
Jo Anne Stegbauer		0.122	-0.063
Ste. Genevieve		0.061	-0.062
Bob White		0.061	-0.078
Night14-01	08/14/91	0.092	-0.062
Night14-02		0.092	-0.062
Irving Crown		0.092	-0.047
Gordon Jones		0.167	-0.154
George W. Shamblin		0.122	-0.031
Katherine L.		0.198	-0.045
Thruston B. Morton		0.08	-0.062
Julie White		0.045	-0.078
Ranger		0.13*	-0.01*
Illini		0.076	-0.047
Bronwynne Brent		0.076	-0.048
Sugarland		0.031	-0.062
Frank Stegbauer		0.168	-0.093
Bill McCormick	08/15/91		
Marvin E. Norman		0.06*	-0.061*
Olmstead		0.076	-0.079
Jack D.Wofford		0.061	-0.094
Dixie Express		0.122	-0.094
Hal D. Miller		0.061	-0.124
Jesse Brent		0.107	-0.093

*taken from a staff gage reading

Apple River Island Site

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Yazoo	5/18/90	0.03*	-0.015*
Cooperative Ambassador		0.03*	-0.076*
Christine Bailey		0.04*	-0.067*
Kathy Ellen			
W.A. Kernan	5/19/90		
Hornet		0.05*	-0.05*
Conti Bonnie		0.09*	-0.06*
Becky Lynn		0.09*	-0.10*
Lexington			-0.046*
Philip M. Pfeffer	5/20/90		
Merlin Banta			
Rusty Flowers		0.122	-0.077
Tom Talbert		0.29	-0.095
Herman Pott			-0.106*
Walter Brunson	5/21/90	0.122	-0.073
Dell Butcher		0.107	-0.058
Mary Gail		0.092	-0.031
T. S. Kunsman		0.168	-0.104
D. Ray Miller		0.092	-0.088
Mary Gail	5/22/90	0.077	-0.042
Trojan		0.107	-0.045
Melinda Brent		0.092	-0.015
Cooperative Mariner		0.259	-0.095
Ed Renshaw		0.16*	-0.122*
Kevin Michael	5/23/90	0.11*	-0.03*
Jack D. Wofford		0.121	-0.046
Trojan		0.121	-0.031

*taken from a staff gage reading

Goose Island Site, Trip 1

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Sierra Dawn	8/24/90		
Dell Butcher		0.122	-0.061
William C. Norman		0.122	-0.046
Normania		0.107	-0.046
Dave Carleton			
Hugh C. Blaske	8/25/90	0.092	-0.063
Teresa Renee Beesecker		0.122	-0.094
Trojan Warrior		0.122	-0.063
Hoosier State		0.12	-0.046
Reliance	8/26/90		
Kevin Michael		0.106	-0.063
Sumac		0.655	-0.031
Twin Cities		0.167	-0.094
Cooperative Vanguard			
Superior	8/27/90	0.106	-0.015
Helen M. Clements			
Greenville			

Goose Island Site, Trip 2

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Ardyce Randall	7/18/91	0.02	-0.032
Scarlet Knight		0.107	-0.032
James F. Neal		0.077	-0.032
Helen M. Clements		0.077	-0.031
Elizabeth Ann		0.046	-0.04
Frank T. Heffelfinger	7/19/91	0.046	-0.031
Queen City		0.091	-0.046
Helen M. Clements		0.046	-0.033
Frank T. Heffelfinger		0.061	-0.048
Cooperative Venture			-0.03
Volunteer State		0.106	-0.094
Night19-01		0.031	-0.064
Night19-02		0.031	-0.048
Night20-01	7/20/91		-0.03
Night20-02		0.122	-0.063
G. R. Packet		0.077	-0.048
Prairie Dawn		0.046	-0.024
Prosperity		0.077	-0.024
Clyde Butcher		0.046	-0.063
Lil Charley		0.091	-0.063
C. W. Rushing		0.22	
Conti Nan		0.138	-0.063
Mary L			-0.046
Cooperative Vanguard	7/21/91	0.077	-0.024
Conti Karla		0.091	-0.048
Cooperative Mariner	7/22/91	0.107	-0.063
Hornet		0.076	-0.078
Coperative Ambassador		0.037	-0.063
Eastern			-0.14
Sam M. Fleming		0.061	-0.11
Kevin Michael		0.092	-0.063
A. M. Thompson	7/23/91	0.046	-0.063
Susan Elizabeth			
Lil Charley		0.122	-0.046
Badger		0.122	-0.079
Kay D		0.091	-0.045
Evey T		0.061	-0.034
Robert Ingle		0.061	-0.018

Goose Island Site, Trip 2 (Concluded)

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
Prairie Dawn		0.046	-0.012
G. R. Packet & Pioneer	7/24/91	0.107	-0.046
Mary L		0.077	-0.047
Dub Hollinger		0.046	-0.012
C. W. Rushing		0.092	-0.032
Dell Butcher		0.061	-0.048
Coral Dawn		0.046	-0.033
Teresa R. Beesecker		0.061	-0.03
Sir-Ene		0.03	-0.03
Rusty Flowers		0.061	-0.03

Clarks Ferry Site, Trip 1

Name	*Date*	*Maximum wave height (m)*	*Maximum drawdown (m)*
C.W. Rushing (1)	5/16/91	0.061	-0.03
Donnie Ray Jr. (1)			
Samantha		0.214	-0.015
C.W. Rushing (2)	5/17/91		
Jemco Towing			
T.S. Kunsmann			
Ell Butcher (1)			
Lady Lone Star	5/18/91	0.137	-0.075
Pearl B.	5/19/91	0.092	-0.06
Conti-Afton		0.061*	-0.06*
Jack D. Wofford		0.091*	-0.06
Donnie Ray Jr. (2)	5/20/91	0.061*	-0.06*
Sunflower (1)		0.137	-0.03
American Beauty (1)		0.214	-0.059
Sierra Dawn	5/21/91	0.046	-0.044
Cooperative Vanguard		0.031	-0.03
Cindy J. Erickson		0.091	-0.049
Frank H. Peavy		0.076*	0*
Helen M. Clements		0.153	-0.045
Sunflower (2)		0.106	~0*
Dell Butcher (2)		0.061	-0.06
Hornet		0.138	-0.03
Volunteer State		0.168	-0.049
Enterprise Star		0.137	-0.095
Edward J. Hancock	5/22/91	0.065*	-0.03*
Joe/Nut		0.091*	
Starfire		0.091*	-0.061*
Conti-Karla			-0.031
American Beauty (2)		0.107	-0.061

*taken from a staff gage reading

Clarks Ferry Site, Trip 2

Name	*Date*	*Maximum wave height (m)**	*Maximum drawdown (m)**
C.W. Rushing	10/17/91	0.12	-0.12
Evey-T		0.08	-0.06
Sunflower		0.02	-0.02
Evelyn C.		0.08	-0.05
Sunflower		0.08	-0.01
Conti-Afton		0.05	-0.08
Night 1		0.1	-0.02
Night 2		0.08	-0.02
Night 3		0.05	-0.02
Lady Lone Star	10/18/91	0.06	-0.02
Lady Lone Star		0.06	-0.01
Kevin Michael		0.05	-0.02
Deborah Valentine		0.03	-0.05
Volunteer State		0.17	-0.11
Sunflower		0.14	-0.02
Frank Stegbauer		0.17	-0.14
Joshua		0.03	-0.02
Kathy Ellen	10/19/91	0.09	-0.04
Jack Bullard		0.05	-0.07
Marc		0.05	-0.02
Conti-Nan		0.08	-0.02
Cristina Ecstein		0.04	-0.02
Coast Guard 65504		0.2	-0.01
Prairie Dawn		0.11	-0.05
Noname	10/20/91	0.06	-0.02
Coop. ambassador		0.01	-0.02
Yazoo City		0.08	-0.05
George W. Banta		0.02	-0.04

*taken from a staff gage reading

APPENDIX XIII.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR MCEVER'S ISLAND

McEver's Island Site

60 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	-	-	-	-	-	-	-	-
Elaine Jones		-	-	-	-	-	-	-	-
Nicolas Duncan		63.6	75.0	63.7	54.4	48.3	53.4	56.3	67.5
Mobil Leader	5/18/89	-	-	-	-	-	-	-	-
Reliance		65.8	62.8	43.4	55.4	48.8	67.0	60.6	52.8
Cooperative Vanguard		67.6	62.5	70.0	58.2	48.2	65.2	58.8	41.6
Marvin E. Norman		107.0	63.1	101.6	70.0	67.9	69.7	61.1	44.4
Illini		81.0	94.0	106.5	120.3	-	82.3	74.7	77.0

30 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	-	-	-	-	-	-	-	-
Elaine Jones		-	-	-	-	-	-	-	-
Nicolas Duncan		66.0	90.2	64.8	52.7	54.2	53.6	60.7	70.0
Mobil Leader	5/18/89	39.0	37.0	53.6	47.1	38.6	42.6	32.4	40.9
Reliance		76.8	63.2	65.0	56.2	47.4	66.8	60.0	42.6
Cooperative Vanguard		109.4	62.6	116.3	71.5	71.8	69.3	60.6	44.2
Marvin E. Norman		152.5	102.0	171.0	125.0	78.7	128.7	96.0	71.3
Illini		53.0	56.4	93.2	94.0	-	68.8	64.9	60.4

Preceding Page Blank

McEver's Island Site

10 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	Station a2	Station b1	Station b2	Station b3	Station c1	Station c2	Station c3
Mary Ellen	5/17/89	-	-	-	-	-	-	-	-
Elaine Jones		29.0	29.0	42.3	34.0	32.7	37.3	34.0	30.7
Nicolas Duncan		60.3	92.3	67.7	56.3	50.7	53.8	54.7	49.3
Mobil Leader	5/18/89	42.6	38.2	47.3	45.1	37.2	43.6	41.6	43.3
Reliance		105.4	63.5	91.9	65.4	65.3	69.9	61.5	44.5
Cooperative Vanguard		158.0	88.5	156.0	102.7	86.3	106.0	97.7	78.3
Marvin E. Norman		129.0	100.0	381.3	85.4	96.6	113.0	99.3	70.0
Illini		65.7	95.0	144.6	100.1	-	68.9	65.6	57.4

5 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	Station a2	Station b1	Station b2	Station b3	Station c1	Station c2	Station c3
Mary Ellen	5/17/89	28.0	28.5	145.0	32.7	32.0	34.0	34.7	31.4
Elaine Jones		161.0	29.0	40.0	34.0	31.0	35.0	35.7	32.0
Nicolas Duncan		60.7	87.2	65.7	56.5	52.8	53.8	53.4	49.7
Mobil Leader	5/18/89	44.3	38.7	44.2	43.8	35.8	43.9	41.9	38.0
Reliance		109.4	62.6	116.3	71.5	71.8	69.3	60.6	44.2
Cooperative Vanguard		154.5	102.0	142.7	103.0	84.0	128.3	92.0	74.0
Marvin E. Norman		135.0	106.0	293.3	82.7	72.0	87.3	81.7	62.0
Illini		57.3	100.0	118.6	95.7	-	66.1	64.4	58.6

McEver's Island Site

2 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	29.0	29.0	42.0	33.3	33.3	37.0	34.3	30.0
Elaine Jones		385.0	166.0	352.0	119.0	66.0	377.0	100.3	43.0
Nicolas Duncan		64.7	84.6	66.7	55.9	55.4	53.8	52.8	50.6
Mobil Leader	5/18/89	48.0	39.0	59.7	43.0	35.2	75.3	49.0	35.8
Reliance		101.0	62.0	126.7	73.0	75.7	69.7	60.0	44.1
Cooperative Vanguard		183.0	111.5	201.0	111.7	76.0	119.3	96.8	70.0
Marvin E. Norman		150.5	111.0	144.0	86.7	78.0	89.3	87.3	61.0
Illini		57.0	121.0	103.0	93.0	-	62.0	63.5	60.3

Peak Suspended Sediment Concentrations

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	292.0	58.0	145.0	35.0	34.0	149.0	37.0	33.0
Elaine Jones		385.0	245.0	352.0	145.7	134.0	377.0	140.0	96.7
Nicolas Duncan		70.0	87.2	68.0	56.5	59.2	53.8	53.4	52.7
Mobil Leader	5/18/89	469.0	244.0	310.0	105.0	115.0	230.0	152.0	89.0
Reliance		431.0	143.0	304.0	177.0	101.0	187.0	119.0	52.0
Cooperative Vanguard		389.0	243.0	322.0	125.0	84.7	199.0	126.0	83.7
Marvin E. Norman		298.0	140.0	293.0	88.0	88.0	99.0	89.0	72.3
Illini		78.0	155.0	168.0	108.0	-	82.0	72.0	64.0

McEver's Island Site

Average Suspended Sediment Concentrations

Tow name	*Date*	*Average Suspended Sediment Concentration during Event, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	29.0	29.0	41.0	33.3	32.0	37.7	35.0	31.0
Elaine Jones		130.0	206.0	344.0	145.7	134.0	232.3	135.3	61.0
Nicolas Duncan		67.3	82.8	67.3	55.4	57.2	53.8	52.4	51.3
Mobil Leader	5/18/89	260.0	36.0	93.0	39.7	52.7	138.0	76.7	36.0
Reliance		261.0	60.0	128.0	63.0	66.3	71.0	60.7	42.3
Cooperative Vanguard		295.0	182.0	257.3	85.0	75.3	139.7	101.0	71.3
Marvin E. Norman		157.5	104.0	125.0	88.0	84.7	94.3	84.0	63.0
Illini		56.0	147.5	92.5	107.0	-	75.3	66.0	63.0

2 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	29.5	29.0	42.0	32.0	30.0	37.0	37.0	31.0
Elaine Jones		149.0	144.5	317.3	115.0	129.3	150.7	140.0	77.7
Nicolas Duncan		70.0	81.0	68.0	55.0	59.0	53.8	52.0	52.2
Mobil Leader	5/18/89	356.5	244.0	237.6	60.3	88.0	199.3	113.7	38.0
Reliance		382.0	68.0	245.3	97.7	45.0	148.3	79.0	39.0
Cooperative Vanguard		389.0	206.5	310.0	93.7	75.7	199.0	111.7	75.3
Marvin E. Norman		140.0	106.0	165.0	80.0	82.3	99.0	76.0	66.3
Illini		78.0	147.5	133.5	81.0	-	79.7	72.0	59.7

McEver's Island Site

5 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	292.0	29.0	144.0	35.0	31.0	149.0	35.0	33.0
Elaine Jones		123.5	58.0	239.0	121.0	113.7	131.3	128.0	96.7
Nicolas Duncan		67.3	75.8	66.6	53.7	59.2	53.8	52.2	52.7
Mobil Leader	5/18/89	121.0	148.0	286.0	101.7	115.0	170.7	139.0	89.0
Reliance		132.0	132.5	266.0	150.0	101.0	155.7	119.0	52.0
Cooperative Vanguard		158.0	108.0	322.0	102.3	84.7	147.0	123.0	83.7
Marvin E. Norman		298.0	140.0	126.0	80.7	73.3	81.0	72.0	72.3
Illini		67.5	79.0	100.0	108.0	-	73.7	63.0	62.0

30 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	89.1	85.0	103.5	86.0	79.0	99.8	102.9	81.0
Elaine Jones		76.5	141.0	82.0	74.0	61.5	84.0	79.0	67.0
Nicolas Duncan		64.0	92.0	89.0	77.6	77.0	79.3	73.0	70.0
Mobil Leader	5/18/89	61.5	58.0	87.7	86.7	50.0	71.0	64.3	49.3
Reliance		158.0	108.0	322.0	102.3	84.7	147.0	123.0	83.7
Cooperative Vanguard		140.0	119.5	152.0	76.0	76.7	93.0	72.0	68.7
Marvin E. Norman		66.0	73.0	81.8	90.0	79.8	68.5	65.5	65.5
Illini		72.0	168.0	81.6	52.0	-	68.5	62.9	57.0

McEver's Island Site

60 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	58.0	76.0	66.0	60.0	59.0	71.0	68.0	63.0
Elaine Jones		58.0	75.0	61.0	59.0	53.0	64.0	62.0	54.0
Nicolas Duncan		72.0	90.0	155.0	86.0	62.0	75.0	75.0	67.5
Mobil Leader	5/18/89	112.0	84.3	123.0	86.2	55.0	65.3	61.0	52.3
Reliance		199.0	126.0	112.0	99.3	79.3	81.0	72.7	73.3
Cooperative Vanguard		63.0	70.9	80.2	89.6	73.4	74.0	72.0	70.0
Marvin E. Norman		134.3	57.2	189.9	108.2	-	73.3	67.0	60.2
Illini		84.0	63.0	67.0	63.0	-	68.0	66.0	64.0

90 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	51.8	99.1	52.3	65.2	43.0	57.7	54.5	46.5
Elaine Jones		53.6	74.5	52.9	54.4	43.0	54.7	48.3	45.3
Nicolas Duncan		68.0	77.0	75.5	-	64.0	67.0	70.0	58.0
Mobil Leader	5/18/89	68.6	65.6	48.3	56.8	51.6	63.5	57.3	52.1
Reliance		57.7	64.5	76.8	87.2	65.2	67.5	64.5	67.2
Cooperative Vanguard		132.0	64.2	191.6	108.2	-	73.1	66.8	59.3
Marvin E. Norman		65.0	84.5	98.5	86.0	-	71.3	60.0	65.3
Illini		65.1	60.4	48.1	53.6	-	67.3	60.1	61.9

McEver's Island Site

120 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
Mary Ellen	5/17/89	48.3	63.3	47.3	44.7	39.2	49.3	48.3	44.1
Elaine Jones		46.1	60.6	47.0	45.4	39.8	49.4	48.0	42.4
Nicolas Duncan		-	-	-	-	-	-	-	-
Mobil Leader	5/18/89	63.9	62.2	72.0	57.4	47.4	64.4	58.3	41.2
Reliance		87.0	84.8	165.6	165.5	-	70.9	66.2	57.7
Cooperative Vanguard		71.0	128.0	85.0	106.5	-	69.7	61.0	65.3
Marvin E. Norman		85.3	144.0	77.7	57.3	-	70.9	64.3	59.3
Illini		72.6	63.6	59.2	98.4	-	77.4	67.9	60.4

APPENDIX XIV.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR APPLE RIVER ISLAND

Apple River Island Site

60 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	-	-	-	-	-	-
Rusty Flowers		49.7	81.6	60.3	63.8	63.6	60.8
Tom Talbert		85.6	70.7	66.8	62.5	71.1	61.9
Herman Pott		66.2	71.4	106.9	63.1	72.8	62.9
Walter Brunson	5/21/90	-	-	-	-	-	-
Dell Butcher		55.7	65.9	73.6	57.4	75.6	67.2
Mary Gail		59.6	69.0	77.9	64.1	84.5	66.1
T.S. Kunsman		58.8	73.0	79.1	55.9	80.6	70.8
D. Ray Miller		64.8	71.0	79.6	60.5	78.4	69.7
Mary Gail	5/22/90	-	-	-	-	-	-
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-

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Apple River Island Site

60 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		115.9	114.9	77.0	66.3	102.1	71.5
Trojan		121.6	121.2	76.3	67.4	98.9	70.7

30 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	-	-	-	-	-	-
Rusty Flowers		50.6	64.7	72.4	58.8	65.4	61.0
Tom Talbert		65.5	63.0	67.4	62.4	67.3	59.5
Herman Pott		76.8	74.7	76.3	83.5	65.3	63.0
Walter Brunson	5/21/90	60.0	66.1	74.0	142.7	79.1	64.5
Dell Butcher		96.1	83.8	91.6	101.9	73.8	64.4
Mary Gail		62.5	71.9	79.5	58.4	79.1	70.3
T.S. Kunsman		137.1	130.8	119.4	90.3	78.2	69.9
D. Ray Miller		143.8	123.6	83.7	80.2	87.3	68.6

Apple River Island Site

30 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Mary Gail	5/22/90	-	84.8	95.7	68.2	102.5	79.4
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		69.6	82.5	81.5	68.8	105.1	71.5
Trojan		66.7	76.8	79.3	68.5	94.2	72.1

10 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-

Apple River Island Site

10 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Merlin Banta	5/20/90	-	63.6	61.5	59.9	72.5	57.2
Rusty Flowers		108.9	63.5	68.3	59.8	72.2	59.9
Tom Talbert		58.1	72.2	75.1	61.1	68.4	65.6
Herman Pott		141.3	100.5	77.2	135.0	56.1	58.4
Walter Brunson	5/21/90	55.8	66.8	72.8	71.4	74.1	65.0
Dell Butcher		67.2	74.2	75.3	63.5	72.8	65.3
Mary Gail		154.8	145.9	129.3	97.4	78.2	70.0
T.S. Kunsman		132.2	111.9	80.1	70.3	97.3	66.3
D. Ray Miller		227.7	98.0	80.9	55.6	80.5	68.2
Mary Gail	5/22/90	250.3	93.9	94.5	67.1	93.5	78.8
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		65.3	73.2	79.1	68.1	90.3	71.1
Trojan		65.2	75.6	79.2	63.1	133.7	68.7

Apple River Island Site

5 Minutes Prior to Barge-Tow Passage

		Suspended Sediment Concentration, mg/L					
Tow name	*Date*	*Station a1*	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	54.6	61.9	65.1	60.8	77.5	60.5
Rusty Flowers		93.1	70.5	69.0	60.1	91.1	60.2
Tom Talbert		56.7	78.0	70.1	61.3	68.1	60.2
Herman Pott		130.4	109.6	75.5	97.1	60.5	61.0
Walter Brunson	5/21/90	55.7	65.9	73.6	57.4	75.6	67.2
Dell Butcher		61.0	67.9	75.0	62.6	72.0	63.7
Mary Gail		199.1	183.6	154.1	115.1	78.3	70.4
T.S. Kunsman		117.4	96.6	77.0	63.1	92.6	68.8
D. Ray Miller		161.4	108.6	81.1	61.1	85.8	71.9
Mary Gail	5/22/90	251.3	105.7	91.7	74.1	94.4	78.2
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		67.7	75.8	81.3	67.6	96.6	68.8
Trojan		72.7	75.7	99.3	66.2	88.1	68.0

Apple River Island Site

2 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	55.1	62.1	67.4	60.2	80.3	55.2
Rusty Flowers		81.7	75.6	69.9	60.2	81.4	60.4
Tom Talbert		57.6	70.7	70.7	60.7	69.0	63.2
Herman Pott		123.9	115.1	74.4	74.4	63.1	62.6
Walter Brunson	5/21/90	56.3	64.8	75.1	59.4	78.7	70.1
Dell Butcher		80.5	66.7	72.8	62.6	73.2	65.5
Mary Gail		225.7	206.3	169.0	125.7	78.3	70.6
T.S. Kunsman		97.5	87.6	77.4	63.7	214.1	72.5
D. Ray Miller		161.8	105.2	81.0	62.2	80.4	69.4
Mary Gail	5/22/90	228.1	112.8	91.4	78.4	92.7	77.8
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		63.3	77.3	80.9	67.3	125.8	67.3
Trojan		72.5	73.5	93.0	65.9	128.0	65.3

Apple River Island Site

Peak Suspended Sediment Concentrations

		Suspended Sediment Concentration, mg/L					
Tow name	*Date*	*Station a1*	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	59.4	66.9	78.4	61.2	85.1	61.2
Rusty Flowers		107.9	77.9	80.5	61.6	192.6	61.6
Tom Talbert		265.1	178.1	91.3	65.0	75.8	66.2
Herman Pott		207.6	130.8	184.8	97.1	77.8	63.8
Walter Brunson	5/21/90	90.6	74.0	80.4	212.4	92.0	71.0
Dell Butcher		98.8	118.4	83.3	67.9	74.8	66.9
Mary Gail		225.7	213.9	169.0	129.3	82.3	72.1
T.S. Kunsman		256.0	97.7	82.3	67.3	328.3	72.5
D. Ray Miller		161.8	124.3	114.5	71.8	94.8	71.9
Mary Gail	5/22/90	251.6	173.8	98.7	78.4	94.7	80.0
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		72.7	77.3	99.3	67.6	152.6	69.7
Trojan		90.0	80.8	99.3	69.1	161.4	70.5

Apple River Island Site

Average Suspended Sediment Concentrations

Tow name	Date	*Average Suspended Sediment Concentration during Event, mg/L* Station a1	Station b1	Station c1	Station c2	Station d1	Station d2
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	51.6	64.8	64.9	60.2	74.3	55.7
Rusty Flowers		82.9	77.9	75.5	56.3	73.6	59.1
Tom Talbert		65.5	64.1	70.1	57.8	68.2	65.2
Herman Pott		165.7	118.7	76.5	60.9	73.4	63.1
Walter Brunson	5/21/90	55.1	64.8	77.2	58.3	80.7	67.1
Dell Butcher		63.9	68.1	71.3	67.9	73.3	64.5
Mary Gail		210.0	192.1	109.8	110.2	77.9	69.9
T.S. Kunsman		105.1	85.3	77.0	66.2	328.3	70.1
D. Ray Miller		159.4	119.0	81.6	59.1	82.3	68.9
Mary Gail	5/22/90	188.7	131.8	90.5	69.4	88.3	77.8
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		65.2	75.6	79.2	63.1	133.7	68.7
Trojan		82.3	76.1	84.5	65.3	126.8	66.4

Apple River Island Site

2 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	52.8	60.7	71.6	56.1	67.9	55.9
Rusty Flowers		81.8	72.9	79.0	61.4	76.8	59.3
Tom Talbert		107.1	70.0	83.2	60.1	71.4	65.5
Herman Pott		207.6	124.7	184.8	59.5	77.8	63.0
Walter Brunson	5/21/90	58.3	66.8	80.4	134.5	92.0	65.2
Dell Butcher		69.7	118.4	71.6	63.4	72.9	63.8
Mary Gail		178.2	151.1	94.4	106.0	76.0	70.7
T.S. Kunsman		136.0	87.8	74.9	63.6	84.4	69.7
D. Ray Miller		141.8	117.2	114.5	64.0	86.8	70.0
Mary Gail	5/22/90	169.9	173.8	88.7	69.9	87.1	80.0
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		69.8	76.6	84.8	65.2	112.1	68.6
Trojan		83.4	80.3	84.4	65.3	89.1	70.5

Apple River Island Site

5 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L					
		Station a1	Station b1	Station c1	Station c2	Station d1	Station d2
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	56.9	65.4	64.5	61.2	63.1	57.2
Rusty Flowers		107.9	72.1	75.4	61.6	192.6	61.2
Tom Talbert		265.1	178.1	90.7	60.0	75.8	62.2
Herman Pott		201.3	126.6	133.4	67.6	71.5	63.8
Walter Brunson	5/21/90	90.6	74.0	79.1	59.9	72.1	62.6
Dell Butcher		67.2	67.4	83.3	63.4	70.1	65.9
Mary Gail		147.9	126.0	85.7	86.1	82.3	69.1
T.S. Kunsman		244.1	97.7	82.3	59.5	151.1	68.3
D. Ray Miller		128.9	104.2	98.0	71.6	83.5	68.4
Mary Gail	5/22/90	155.7	160.7	98.7	72.7	93.0	80.0
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		72.7	75.7	99.3	66.2	88.1	68.0
Trojan		79.1	80.8	83.2	67.1	93.9	69.4

Apple River Island Site

30 Minutes after Barge-Tow Passage

Tow name	Date	*Suspended Sediment Concentration, mg/L*					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	53.5	61.9	66.7	59.5	86.0	54.4
Rusty Flowers		69.6	82.3	70.1	61.3	73.8	61.1
Tom Talbert		114.6	85.1	73.2	62.3	74.9	63.1
Herman Pott		114.4	91.4	78.2	70.5	75.4	66.2
Walter Brunson	5/21/90	84.6	77.2	74.6	68.6	74.7	63.3
Dell Butcher		61.4	70.2	77.9	64.6	73.2	66.4
Mary Gail		173.6	104.4	78.4	61.5	76.8	72.0
T.S. Kunsman		105.0	87.6	83.5	64.9	76.6	68.1
D. Ray Miller		71.6	75.4	82.4	64.8	80.8	72.4
Mary Gail	5/22/90	84.9	87.8	95.1	76.7	89.2	77.3
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		70.7	73.8	83.1	67.5	91.1	65.7
Trojan		66.1	71.3	85.3	66.2	93.9	63.5

Apple River Island Site

60 Minutes after Barge-Tow Passage

		Suspended Sediment Concentration, mg/L					
Tow name	*Date*	*Station a1*	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	64.8	65.5	71.7	59.5	65.9	61.3
Rusty Flowers		56.8	79.3	71.6	61.6	67.8	60.7
Tom Talbert		76.8	73.3	73.8	63.8	72.5	69.6
Herman Pott		-	-	-	-	-	-
Walter Brunson	5/21/90	67.2	67.4	83.3	63.4	70.1	65.9
Dell Butcher		72.1	68.4	79.9	67.2	81.4	69.9
Mary Gail		82.7	80.0	80.4	62.4	75.3	69.9
T.S. Kunsman		66.6	73.3	80.8	65.3	75.2	67.7
D. Ray Miller		59.2	76.2	80.9	60.2	85.9	73.9
Mary Gail	5/22/90	72.2	80.5	87.2	75.9	86.5	76.7
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		56.2	69.5	81.5	63.5	100.7	65.5
Trojan		56.3	71.4	78.3	64.5	91.4	80.4

Apple River Island Site

90 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L					
		Station a1	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	51.6	60.7	69.3	59.5	66.4	56.9
Rusty Flowers		168.2	181.6	80.0	65.1	74.1	65.1
Tom Talbert		86.9	69.6	85.2	65.0	72.7	68.9
Herman Pott		-	-	-	-	-	-
Walter Brunson	5/21/90	60.8	71.5	77.1	65.4	76.5	66.2
Dell Butcher		105.4	93.4	79.6	66.1	80.1	69.9
Mary Gail		66.5	74.1	79.4	67.8	83.7	75.5
T.S. Kunsman		85.3	73.8	81.7	89.5	102.7	77.5
D. Ray Miller		72.7	73.9	81.7	84.5	94.4	77.7
Mary Gail	5/22/90	92.6	77.8	88.8	82.1	89.2	76.0
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		55.9	71.3	78.4	63.9	98.2	75.9
Trojan		52.6	70.2	76.1	64.5	85.6	95.0

Apple River Island Site

120 Minutes after Barge-Tow Passage

		Suspended Sediment Concentration, mg/L					
Tow name	*Date*	*Station a1*	*Station b1*	*Station c1*	*Station c2*	*Station d1*	*Station d2*
Yazoo	5/18/90	-	-	-	-	-	-
Cooperative Ambassador		-	-	-	-	-	-
Christine Bailey		-	-	-	-	-	-
Kathy Ellen		-	-	-	-	-	-
W.A. Kernan	5/19/90	-	-	-	-	-	-
Hornet		-	-	-	-	-	-
Conti-Bonnie		-	-	-	-	-	-
Becky Lynn		-	-	-	-	-	-
Merlin Banta	5/20/90	64.8	61.4	67.9	59.1	66.6	59.9
Rusty Flowers		107.0	71.6	77.7	62.9	72.2	63.9
Tom Talbert		63.3	70.5	113.5	62.9	71.9	63.0
Herman Pott		-	-	-	-	-	-
Walter Brunson	5/21/90	112.2	69.8	80.0	66.3	78.4	70.1
Dell Butcher		64.5	70.6	80.5	70.4	83.5	68.5
Mary Gail		71.6	72.0	82.3	95.1	118.3	82.6
T.S. Kunsman		66.5	75.9	81.4	77.0	88.3	76.1
D. Ray Miller		-	-	-	-	-	-
Mary Gail	5/22/90	72.7	85.7	95.0	70.3	87.2	66.2
Trojan		-	-	-	-	-	-
Melinda Brent		-	-	-	-	-	-
Corporative Mariner		-	-	-	-	-	-
Ed Renshaw		-	-	-	-	-	-
Kevin Michael	5/23/90	-	-	-	-	-	-
Jack D. Wofford		-	-	-	-	-	-
Trojan		-	-	-	-	-	-

APPENDIX XV.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR GOOSE ISLAND, TRIP 1

Goose Island Site, Trip 1

60 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		184.0	217.7	203.7	463.8	181.2
William C. Norman		187.2	211.4	204.5	276.9	178.5
Normania		159.7	198.3	195.0	196.5	181.1
Dave Carlton		191.8	208.0	194.7	193.4	182.1
Hugh C. Blaske	8/25/90	153.4	152.7	165.6	169.9	149.4
Teresa Renee		151.2	148.5	148.8	164.6	148.0
Trojan Warrior		154.9	151.1	157.7	169.8	154.7
Hoosier State		162.7	157.8	151.0	165.3	146.9
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		161.3	153.9	154.0	288.7	147.7
Sumac		172.1	168.3	159.9	182.1	155.8
Twin Cities		168.4	166.2	166.1	170.9	147.6
Cooperative Vanguard		170.3	175.9	165.5	177.8	158.6
Superior	8/27/90	-	-	-	-	-
Helen M. Clements		165.6	179.4	171.8	465.0	264.5

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Goose Island Site, Trip 1

30 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		168.7	201.8	198.1	203.7	180.0
William C. Norman		187.1	215.7	197.6	287.9	181.8
Normania		283.9	222.4	223.5	325.4	180.1
Dave Carlton		191.2	193.4	179.6	188.4	174.1
Hugh C. Blaske	8/25/90	158.8	149.6	149.1	164.4	147.8
Teresa Renee		168.9	146.5	151.7	163.0	151.9
Trojan Warrior		155.1	147.2	143.3	164.2	150.7
Hoosier State		162.1	153.1	152.5	160.6	189.1
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		156.9	147.8	151.4	166.3	146.7
Sumac		163.2	158.2	156.8	173.0	149.8
Twin Cities		173.2	165.4	163.0	181.3	158.7
Cooperative Vanguard		187.9	174.2	164.3	184.7	155.5
Superior	8/27/90	-	-	-	-	-
Helen M. Clements		167.8	178.2	170.0	202.8	192.0

Goose Island Site, Trip 1

10 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L Station a1	Station b1	Station b2	Station c1	Station c2
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		189.1	229.2	201.7	494.5	179.5
William C. Norman		331.5	251.8	237.8	253.0	186.2
Normania		217.3	228.0	199.0	204.5	269.1
Dave Carlton		182.2	188.5	179.6	189.7	176.2
Hugh C. Blaske	8/25/90	155.7	148.9	148.6	164.0	148.1
Teresa Renee		152.5	164.1	136.7	164.4	146.0
Trojan Warrior		164.4	162.3	140.6	160.0	149.1
Hoosier State		160.5	153.3	151.0	160.0	158.0
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		149.6	155.0	151.6	167.8	145.6
Sumac		163.7	163.4	160.6	171.1	147.6
Twin Cities		168.3	170.0	158.6	173.7	153.0
Cooperative Vanguard		186.8	168.2	157.1	176.1	153.7
Superior	8/27/90	229.7	222.3	201.5	223.3	181.3
Helen M. Clements		180.3	190.3	179.3	244.8	178.6

Goose Island Site, Trip 1

5 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		190.5	238.8	204.6	642.1	177.9
William C. Norman		258.4	217.1	204.7	217.1	177.0
Normania		214.9	199.5	190.9	202.0	199.6
Dave Carlton		182.7	187.7	180.6	191.3	177.2
Hugh C. Blaske	8/25/90	152.0	148.6	148.8	164.5	148.0
Teresa Renee		156.2	161.3	138.4	166.7	148.6
Trojan Warrior		164.2	156.4	139.6	165.2	146.9
Hoosier State		160.4	153.3	151.0	160.7	146.8
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		150.0	158.7	152.0	166.7	146.2
Sumac		166.0	165.0	164.4	170.3	147.3
Twin Cities		245.4	171.0	160.6	172.7	153.0
Cooperative Vanguard		186.3	173.0	155.5	177.7	152.8
Superior	8/27/90	258.7	235.8	211.0	234.1	184.9
Helen M. Clements		253.4	195.0	182.8	241.4	187.5

Goose Island Site, Trip 1

2 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		303.4	207.6	207.1	211.6	181.3
William C. Norman		232.3	206.3	208.2	199.9	185.0
Normania		254.0	201.1	195.4	200.4	237.6
Dave Carlton		183.0	187.2	181.2	192.2	177.8
Hugh C. Blaske	8/25/90	149.7	148.4	148.9	164.7	148.0
Teresa Renee		160.9	162.5	144.0	162.3	155.4
Trojan Warrior		159.4	158.8	141.7	164.5	149.5
Hoosier State		160.2	153.2	152.0	162.8	145.4
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		152.6	158.2	152.6	167.7	147.3
Sumac		173.0	168.4	169.4	172.1	148.3
Twin Cities		269.9	169.3	163.5	183.6	153.8
Cooperative Vanguard		183.9	174.7	155.6	180.3	154.2
Superior	8/27/90	276.2	243.9	216.8	240.6	187.1
Helen M. Clements		359.8	198.5	185.3	225.0	199.6

Goose Island Site, Trip 1

Peak Suspended Sediment Concentrations for the Events

		Suspended Sediment Concentration, mg/L				
Tow name	***Date***	***Station a1***	***Station b1***	***Station b2***	***Station c1***	***Station c2***
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		331.5	251.8	241.7	642.1	190.0
William C. Norman		258.4	217.1	211.8	233.3	235.7
Normania		267.7	215.7	210.1	203.4	276.9
Dave Carlton		198.8	191.7	191.2	192.2	178.0
Hugh C. Blaske	8/25/90	154.9	153.3	159.7	193.4	155.3
Teresa Renee		164.4	162.6	144.0	166.7	155.4
Trojan Warrior		192.7	168.8	143.7	185.7	276.5
Hoosier State		160.4	166.5	153.9	178.9	194.1
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		158.9	160.9	154.0	179.6	147.3
Sumac		194.5	176.2	181.0	197.1	155.2
Twin Cities		297.0	182.7	173.2	195.2	160.2
Cooperative Vanguard		187.0	179.0	163.6	190.8	155.1
Superior	8/27/90	305.2	257.4	236.3	258.4	198.7
Helen M. Clements		359.8	225.8	215.6	252.3	265.3

Goose Island Site, Trip 1

Average Suspended Sediment Concentrations

Tow name	Date	Average Suspended Sediment Concentration during Event, mg/L				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		292.4	204.3	203.5	223.2	180.5
William C. Norman		231.7	212.5	204.1	196.1	212.1
Normania		248.6	203.0	189.3	200.0	276.9
Dave Carlton		180.5	185.1	186.3	189.8	176.4
Hugh C. Blaske	8/25/90	151.8	148.8	149.0	169.9	148.0
Teresa Renee		159.6	159.8	137.2	158.1	142.7
Trojan Warrior		163.8	163.0	139.1	179.8	149.5
Hoosier State		157.6	153.0	152.6	167.6	144.4
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		154.4	156.3	154.0	174.9	145.4
Sumac		170.1	170.6	179.7	175.6	148.9
Twin Cities		217.5	170.0	164.4	194.4	153.5
Cooperative Vanguard		184.6	177.2	155.7	184.5	155.1
Superior	8/27/90	287.8	249.3	220.6	244.9	188.6
Helen M. Clements		290.5	204.3	193.4	210.8	234.5

Goose Island Site, Trip 1

2 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		250.5	228.4	233.9	252.4	190.0
William C. Norman		213.7	210.7	198.2	201.5	213.8
Normania		229.2	205.2	210.1	200.8	188.0
Dave Carlton		193.2	187.0	184.6	188.0	173.9
Hugh C. Blaske	8/25/90	153.5	151.3	159.7	184.2	149.2
Teresa Renee		159.4	156.6	137.1	160.5	145.6
Trojan Warrior		192.7	163.6	139.4	177.1	150.2
Hoosier State		156.0	151.1	146.0	166.3	142.2
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		156.2	156.0	149.9	175.8	146.8
Sumac		179.7	172.9	176.0	187.8	150.9
Twin Cities		181.4	177.5	162.1	194.9	154.1
Cooperative Vanguard		186.5	176.3	160.6	189.2	152.2
Superior	8/27/90	299.4	254.7	224.4	249.2	190.1
Helen M. Clements		275.9	198.1	195.4	209.9	225.6

Goose Island Site, Trip 1

5 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L* Station a1	Station b1	Station b2	Station c1	Station c2
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		296.1	225.1	232.6	449.9	181.2
William C. Norman		205.7	207.5	183.8	204.4	189.4
Normania		222.6	215.7	199.1	203.2	240.6
Dave Carlton		194.3	191.7	177.3	188.1	174.8
Hugh C. Blaske	8/25/90	154.9	151.1	157.7	169.8	154.7
Teresa Renee		164.4	157.0	140.6	165.6	147.4
Trojan Warrior		190.8	168.8	143.7	185.7	276.5
Hoosier State		156.3	166.5	153.9	178.9	170.4
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		158.9	154.8	151.8	167.8	144.5
Sumac		193.7	176.2	181.0	178.1	153.5
Twin Cities		169.0	172.6	169.0	181.1	158.0
Cooperative Vanguard		176.8	176.3	163.6	190.8	152.9
Superior	8/27/90	296.3	252.7	236.3	258.4	198.7
Helen M. Clements		259.7	225.8	215.6	252.3	208.1

Goose Island Site, Trip 1

30 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		218.9	201.5	194.4	204.1	199.6
William C. Norman		232.5	211.6	203.2	204.7	273.3
Normania		228.1	220.4	210.1	211.0	185.1
Dave Carlton		183.0	196.1	195.7	190.2	179.3
Hugh C. Blaske	8/25/90	157.3	140.3	151.0	163.5	149.1
Teresa Renee		200.1	176.5	153.3	170.5	190.0
Trojan Warrior		204.1	169.1	153.4	172.7	187.7
Hoosier State		194.6	168.5	203.1	168.1	147.7
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		163.4	165.8	158.6	174.4	152.9
Sumac		168.4	169.2	164.4	178.8	160.2
Twin Cities		186.5	171.1	156.1	177.1	153.2
Cooperative Vanguard		175.3	173.9	161.5	188.7	155.6
Superior	8/27/90	220.9	202.2	192.4	221.8	180.7
Helen M. Clements		194.7	204.9	193.1	214.8	278.1

Goose Island Site, Trip 1

60 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		228.4	220.6	211.4	217.3	282.6
William C. Norman		207.3	210.4	204.5	204.9	188.6
Normania		218.9	201.5	194.4	198.1	179.4
Dave Carlton		174.8	185.4	211.4	188.6	174.0
Hugh C. Blaske	8/25/90	164.2	156.4	139.6	165.2	146.9
Teresa Renee		284.2	175.5	186.7	196.3	210.2
Trojan Warrior		272.5	206.7	197.7	208.1	206.8
Hoosier State		191.0	155.2	154.8	162.8	145.9
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		166.2	163.8	159.4	180.9	155.3
Sumac		169.8	177.7	173.2	188.2	160.2
Twin Cities		188.0	174.1	161.3	174.2	154.5
Cooperative Vanguard		170.2	171.7	163.1	180.6	155.0
Superior	8/27/90	163.3	184.1	173.8	203.9	206.3
Helen M. Clements		171.9	238.4	176.7	205.3	174.1

Goose Island Site, Trip 1

90 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		218.7	202.8	193.3	199.3	179.8
William C. Norman		213.6	199.0	191.0	200.1	179.6
Normania		234.3	195.9	188.3	190.6	176.7
Dave Carlton		-	-	-	-	-
Hugh C. Blaske	8/25/90	193.0	169.7	152.2	175.0	156.5
Teresa Renee		194.9	178.6	171.6	174.4	154.8
Trojan Warrior		181.0	167.7	163.9	172.4	264.1
Hoosier State		-		-	-	-
Reliance	8/26/90	-		-	-	-
Kevin Michael		163.7	163.4	160.4	171.1	147.6
Sumac		184.7	174.2	155.6	179.4	153.7
Twin Cities		168.4	173.6	166.7	185.2	157.6
Cooperative Vanguard		159.9	167.2	154.7	188.0	154.2
Superior	8/27/90	163.9	178.3	170.2	487.8	236.4
Helen M. Clements		162.0	179.4	169.7	186.7	158.8

Goose Island Site, Trip 1

120 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*				
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*
Sierra Dawn	8/24/90	-	-	-	-	-
Dell Butcher		206.0	204.0	192.6	192.5	180.3
William C. Norman		216.3	195.8	184.0	190.2	174.9
Normania		182.2	190.5	177.7	186.8	174.1
Dave Carlton		-	-	-	-	-
Hugh C. Blaske	8/25/90	260.1	196.8	197.0	198.7	257.1
Teresa Renee		165.3	161.2	153.6	165.8	175.5
Trojan Warrior		162.9	160.5	151.7	165.4	147.5
Hoosier State		-	-	-	-	-
Reliance	8/26/90	-	-	-	-	-
Kevin Michael		175.0	164.2	163.0	178.5	151.7
Sumac		189.4	232.7	162.4	186.8	158.1
Twin Cities		165.6	164.8	154.8	182.2	152.6
Cooperative Vanguard		-	-	-	-	-
Superior	8/27/90	168.9	181.1	172.4	205.0	251.4
Helen M. Clements		151.4	174.2	166.8	180.2	160.9

APPENDIX XVI.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR KAMPSVILLE, TRIP 1

Kampsville Site, Trip 1

60 Minutes Prior to Barge-Tow Passage

Tow name	Date	Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
		Suspended Sediment Concentration, mg/L								
Mr. Aldo	10/12/90	95.1	91.1	159.0	138.8	195.3	-	-	-	-
Floyd Blaske		95.9	92.2	162.3	140.5	198.9	-	-	-	-
Luke Burton	10/13/90	-	-	-	-	-	-	-	-	-
Sugarland		-	-	-	-	-	-	-	-	-
William C. Norman		312.0	288.9	245.5	220.6	291.4	244.0	-	-	-
Frank H. Peavey		153.7	147.5	-	-	296.2	244.7	-	-	-
Conti-Karla		181.1	173.4	-	-	349.8	252.9	-	-	-
Mr. Paul	10/14/90	227.6	214.8	317.8	414.0	-	-	-	-	-
Rambler		202.7	188.3	284.8	258.8	-	-	-	-	-
Mr. Lawrence		318.5	300.7	373.2	389.7	-	-	-	-	-
Mallard		215.7	171.5	300.6	933.7	-	-	-	-	-
Charles Lehman		248.6	223.0	304.2	274.5	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	-	-	-	-	-	-	-	-	-
Mr. Paul		206.0	188.8	287.3	268.0	419.7	284.2	-	-	-
Exxon St. Louis		193.4	183.6	297.2	270.6	367.5	296.5	-	-	-
Margaret O		190.0	181.4	296.3	267.4	369.7	300.9	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-

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Kampsville Site, Trip 1

60 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
A. L. Smith	10/16/90	201.7	200.6	255.4	234.7	499.8	315.5	-	-	-
Ste. Genevieve		246.2	217.7	-	-	338.3	265.8	453.8	316.0	482.8
Nicole Brent	10/17/90	-	-	-	-	-	-	-	-	-
Frank H. Peavey		182.9	186.0	226.3	194.0	-	-	-	-	-

30 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
Mr. Aldo	10/12/90	96.9	93.5	166.1	142.3	203.1	-	-	-	-
Floyd Blaske		97.8	94.6	169.4	143.9	206.7	-	-	-	-
Luke Burton	10/13/90	-	-	-	-	-	-	-	-	-
Sugarland		-	-	-	-	-	-	-	-	-
William C. Norman		333.4	293.4	263.2	231.6	303.2	226.4	-	-	-
Frank H. Peavey		157.6	137.6	-	-	292.4	233.9	-	-	-
Conti-Karla		201.1	193.2	-	-	313.7	269.0	-	-	-

Kampsville Site, Trip 1

30 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Paul	10/14/90	208.9	194.2	284.0	272.3	-	-	-	-	-
Rambler		186.2	178.6	290.9	268.0	-	-	-	-	-
Mr. Lawrence		242.4	223.6	332.0	297.2	-	-	-	-	-
Mallard		336.8	327.0	302.1	268.7	-	-	-	-	-
Charles Lehman		230.1	209.3	306.7	265.3	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	-	-	-	-	-	-	-	-	-
Mr. Paul		195.6	176.9	280.4	246.5	385.9	279.1	-	-	-
Exxon St. Louis		205.3	190.6	308.6	277.4	356.7	292.2	-	-	-
Margaret O		215.6	192.7	314.0	281.9	356.3	288.2	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	229.8	185.2	230.2	215.6	552.7	242.4	-	-	-
Ste. Genevieve		228.1	202.7	-	-	339.2	278.6	444.9	354.2	475.7
Nicole Brent	10/17/90	181.1	184.4	217.5	187.5	-	-	-	-	-
Frank H. Peavey		222.7	221.7	240.1	208.1	-	-	-	-	-

Kampsville Site, Trip 1

10 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	97.7	94.7	172.5	151.5	207.4	-	-	-	-
Floyd Blaske		99.4	98.5	173.6	153.0	211.1	-	-	-	-
Luke Burton	10/13/90	-	-	-	-	-	-	-	-	-
Sugarland		139.5	127.6	220.0	199.1	274.8	227.0	-	-	-
William C. Norman		176.2	161.4	256.4	218.7	319.4	253.8	-	-	-
Frank H. Peavey		145.0	139.8	-	-	293.6	237.5	-	-	-
Conti-Karla		179.9	171.9	-	-	370.1	446.1	-	-	-
Mr. Paul	10/14/90	193.9	179.7	293.3	267.4	-	-	-	-	-
Rambler		307.2	291.3	360.8	416.6	-	-	-	-	-
Mr. Lawrence		233.1	217.6	315.0	262.9	-	-	-	-	-
Mallard		256.0	234.0	310.8	275.3	-	-	-	-	-
Charles Lehman		229.3	214.6	275.9	254.1	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	211.2	198.8	334.1	269.9	357.7	296.7	-	-	-
Mr. Paul		198.7	177.1	279.7	232.3	336.7	278.5	-	-	-
Exxon St. Louis		227.1	187.2	314.9	283.1	371.6	287.1	-	-	-
Margaret O		347.1	249.6	316.0	284.4	398.8	292.0	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	229.6	179.3	230.5	211.2	557.8	275.1	-	-	-
Ste. Genevieve		233.9	211.3	-	-	331.7	283.2	426.6	349.1	457.6
Nicole Brent	10/17/90	182.5	185.4	227.4	194.7	-	-	-	-	-
Frank H. Peavey		204.5	205.7	239.1	212.7	-	-	-	-	-

Kampsville Site, Trip 1

5 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	97.5	94.7	175.3	158.9	207.7	-	-	-	-
Floyd Blaske		108.9	100.9	210.4	163.7	204.4	-	-	-	-
Luke Burton	10/13/90	138.8	128.4	219.4	198.8	277.3	229.6	-	-	-
Sugarland		135.8	131.5	217.1	197.8	287.2	239.9	-	-	-
William C. Norman		172.0	155.9	257.6	230.6	316.9	259.3	-	-	-
Frank H. Peavey		145.0	140.7	-	-	287.9	235.9	-	-	-
Conti-Karla		182.4	172.1	-	-	537.4	265.9	-	-	-
Mr. Paul	10/14/90	197.5	183.4	289.6	271.4	-	-	-	-	-
Rambler		290.4	278.3	348.5	386.8	-	-	-	-	-
Mr. Lawrence		220.6	208.5	303.5	260.7	-	-	-	-	-
Mallard		238.5	221.7	298.3	261.1	-	-	-	-	-
Charles Lehman		230.3	218.6	339.6	271.6	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	209.3	196.4	330.6	269.8	351.5	295.6	-	-	-
Mr. Paul		201.8	180.2	280.1	235.8	333.0	278.8	-	-	-
Exxon St. Louis		233.5	184.1	315.4	283.7	380.1	286.5	-	-	-
Margaret O		287.2	257.2	316.5	285.0	351.6	297.8	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	189.0	172.4	231.0	211.0	561.7	311.1	-	-	-
Ste. Genevieve		234.5	213.5	-	-	327.8	285.3	421.7	346.7	454.2
Nicole Brent	10/17/90	181.4	184.0	230.3	196.4	-	-	-	-	-
Frank H. Peavey		204.0	204.2	236.0	212.0	-	-	-	-	-

Kampsville Site, Trip 1

2 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
Mr. Aldo	10/12/90	100.5	98.1	186.5	158.5	230.0	-	-	-	-
Floyd Blaske		109.6	103.2	206.5	157.5	197.4	-	-	-	-
Luke Burton	10/13/90	136.6	130.7	217.7	198.1	284.7	237.4	-	-	-
Sugarland		218.9	174.6	254.1	205.8	307.1	182.3	-	-	-
William C. Norman		172.1	155.1	258.8	239.2	314.4	262.9	-	-	-
Frank H. Peavey		149.1	141.3	-	-	370.2	234.9	-	-	-
Conti-Karla		239.9	180.2	-	-	536.5	249.6	-	-	-
Mr. Paul	10/14/90	198.1	188.7	296.2	273.9	-	-	-	-	-
Rambler		271.3	264.6	337.5	368.4	-	-	-	-	-
Mr. Lawrence		193.8	196.0	303.4	263.9	-	-	-	-	-
Mallard		227.2	208.6	292.8	259.6	-	-	-	-	-
Charles Lehman		217.7	206.3	319.9	271.8	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	208.1	195.0	328.5	269.7	347.8	294.9	-	-	-
Mr. Paul		204.6	183.3	280.6	240.7	334.1	279.3	-	-	-
Exxon St. Louis		237.3	182.3	315.7	284.0	385.2	286.1	-	-	-
Margaret O		290.9	253.2	316.8	285.4	361.3	287.4	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	166.9	168.3	231.2	210.9	422.3	332.7	-	-	-
Ste. Genevieve		234.9	214.9	-	-	325.5	286.6	422.5	345.2	456.4
Nicole Brent	10/17/90	180.8	183.2	231.9	197.4	-	-	-	-	-
Frank H. Peavey		200.7	210.6	251.5	213.8	-	-	-	-	-

Kampsville Site, Trip 1

Peak Suspended Sediment Concentrations

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
Mr. Aldo	10/12/90	106.3	101.4	349.9	161.9	230.0	-	-	-	-
Floyd Blaske		157.1	144.8	248.3	186.8	253.2	-	-	-	-
Luke Burton	10/13/90	245.8	193.1	256.9	210.1	313.3	242.5	-	-	-
Sugarland		285.8	257.0	287.8	229.3	319.5	251.4	-	-	-
William C. Norman		188.9	155.4	276.3	242.1	332.9	264.2	-	-	-
Frank H. Peavey		213.6	167.9	-	-	454.7	246.0	-	-	-
Conti-Karla		286.3	267.3	-	-	551.1	279.4	-	-	-
Mr. Paul	10/14/90	201.0	188.7	306.4	273.9	-	-	-	-	-
Rambler		277.7	269.2	341.1	374.5	-	-	-	-	-
Mr. Lawrence		356.8	275.7	348.3	362.9	-	-	-	-	-
Mallard		276.9	226.7	320.4	274.5	-	-	-	-	-
Charles Lehman		379.4	275.7	443.8	305.2	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	208.5	195.5	329.2	269.7	349.0	295.1	-	-	-
Mr. Paul		209.2	188.5	281.4	248.8	336.1	280.0	-	-	-
Exxon St. Louis		379.1	274.0	316.2	284.7	448.1	305.4	-	-	-
Margaret O		310.6	257.5	317.2	286.0	373.4	318.8	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	174.5	169.7	231.7	210.9	563.2	332.7	-	-	-
Ste. Genevieve		261.3	229.6	-	-	328.3	287.1	477.8	345.7	529.5
Nicole Brent	10/17/90	223.1	231.5	252.2	208.4	-	-	-	-	-
Frank H. Peavey		229.5	236.5	252.2	215.1	-	-	-	-	-

Kampsville Site, Trip 1

2 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	103.9	95.6	173.7	145.0	191.8	-	-	-	-
Floyd Blaske		153.1	142.3	222.8	184.5	253.2	-	-	-	-
Luke Burton	10/13/90	218.9	174.6	254.1	205.8	307.1	182.3	-	-	-
Sugarland		270.0	239.7	269.5	229.3	302.8	251.4	-	-	-
William C. Norman		177.5	149.7	273.3	222.2	322.3	251.8	-	-	-
Frank H. Peavey		199.2	162.3	-	-	336.9	239.2	-	-	-
Conti-Karla		263.1	245.0	-	-	450.3	279.4	-	-	-
Mr. Paul	10/14/90	193.2	182.9	282.1	255.4	-	-	-	-	-
Rambler		232.8	232.8	321.2	274.5	-	-	-	-	-
Mr. Lawrence		306.6	264.5	348.3	316.7	-	-	-	-	-
Mallard		262.8	226.7	312.3	270.8	-	-	-	-	-
Charles Lehman		379.4	257.1	443.8	292.1	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	206.6	193.1	325.7	269.6	342.8	294.0	-	-	-
Mr. Paul		208.3	187.5	281.2	247.2	335.7	279.8	-	-	-
Exxon St. Louis		315.1	261.8	316.1	284.5	448.1	298.7	-	-	-
Margaret O		276.2	252.2	317.2	285.9	369.8	315.4	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	165.7	160.7	231.6	210.8	351.6	226.3	-	-	-
Ste. Genevieve		261.3	226.9	-	-	320.6	283.3	477.8	343.3	529.5
Nicole Brent	10/17/90	198.2	219.2	226.3	204.7	-	-	-	-	-
Frank H. Peavey		223.7	224.7	250.6	213.3	-	-	-	-	-

Kampsville Site, Trip 1

5 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	105.2	100.6	179.8	157.3	208.0	-	-	-	-
Floyd Blaske		139.4	120.8	205.0	176.2	217.8	-	-	-	-
Luke Burton	10/13/90	285.8	225.6	287.8	221.9	319.5	247.2	-	-	-
Sugarland		354.4	279.1	226.6	212.7	279.6	243.4	-	-	-
William C. Norman		194.0	170.4	285.0	257.9	346.4	264.0	-	-	-
Frank H. Peavey		177.4	170.3	-	-	391.7	244.7	-	-	-
Conti-Karla		252.8	210.9	-	-	409.0	265.7	-	-	-
Mr. Paul	10/14/90	196.5	173.6	293.7	260.0	-	-	-	-	-
Rambler		242.6	241.3	338.7	307.5	-	-	-	-	-
Mr. Lawrence		301.5	299.8	305.0	300.7	-	-	-	-	-
Mallard		255.1	222.8	325.5	273.1	-	-	-	-	-
Charles Lehman		294.1	280.2	312.7	287.8	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	205.4	191.7	323.6	269.5	339.1	293.3	-	-	-
Mr. Paul		211.1	190.6	281.7	252.1	336.8	280.2	-	-	-
Exxon St. Louis		285.0	252.6	316.4	284.9	355.5	304.0	-	-	-
Margaret O		252.0	234.6	317.4	286.3	361.2	324.9	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	175.6	163.2	231.9	210.7	373.2	204.2	-	-	-
Ste. Genevieve		238.4	214.5	-	-	323.4	279.5	409.2	341.8	445.7
Nicole Brent	10/17/90	342.9	213.0	234.3	202.3	-	-	-	-	-
Frank H. Peavey		236.8	241.4	251.8	222.3	-	-	-	-	-

Kampsville Site, Trip 1

30 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L								
		Station a1	Station a2	Station b1	Station b2	Station c1	Station c2	Station d1	Station d2	Station d3
Mr. Aldo	10/12/90	134.0	128.5	214.2	224.7	229.8	-	-	-	-
Floyd Blaske		124.6	117.5	194.9	169.0	226.9	-	-	-	-
Luke Burton	10/13/90	302.0	201.0	260.0	225.1	297.5	248.4	-	-	-
Sugarland		348.1	270.1	256.1	220.5	289.1	234.5	-	-	-
William C. Norman		191.5	193.3	270.3	294.7	398.4	321.4	-	-	-
Frank H. Peavey		268.4	241.5	-	-	309.6	247.4	-	-	-
Conti-Karla		256.5	211.7	-	-	381.7	294.0	-	-	-
Mr. Paul	10/14/90	305.9	290.0	359.1	410.7	-	-	-	-	-
Rambler		217.3	180.3	304.5	765.8	-	-	-	-	-
Mr. Lawrence		285.9	252.5	311.5	270.8	-	-	-	-	-
Mallard		230.0	208.1	302.2	269.3	-	-	-	-	-
Charles Lehman		310.8	291.0	355.9	292.4	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	195.4	181.8	306.1	260.7	328.2	279.9	-	-	-
Mr. Paul		221.2	202.7	290.0	269.3	362.0	281.3	-	-	-
Exxon St. Louis		294.5	259.4	318.8	288.0	474.6	365.7	-	-	-
Margaret O		272.6	234.4	319.9	289.4	419.0	343.8	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	255.4	240.3	234.1	209.7	271.9	238.7	-	-	-
Ste. Genevieve		248.5	231.2	-	-	330.5	271.5	445.1	329.7	472.7
Nicole Brent	10/17/90	208.2	210.0	238.4	209.4	-	-	-	-	-
Frank H. Peavey		205.9	213.0	263.1	243.9	-	-	-	-	-

Kampsville Site, Trip 1

60 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	116.7	111.4	189.0	174.2	220.9	-	-	-	-
Floyd Blaske		124.3	454.0	187.6	172.4	229.1	-	-	-	-
Luke Burton	10/13/90	189.1	174.3	257.4	217.8	317.3	252.1	-	-	-
Sugarland		171.9	157.1	256.1	219.0	320.1	254.4	-	-	-
William C. Norman		190.5	181.4	260.1	233.7	304.7	251.1	-	-	-
Frank H. Peavey		188.2	174.8	-	-	536.1	260.4	-	-	-
Conti-Karla		222.2	200.0	-	-	397.9	282.6	-	-	-
Mr. Paul	10/14/90	228.8	227.7	312.5	282.6	-	-	-	-	-
Rambler		348.6	321.5	305.2	274.5	-	-	-	-	-
Mr. Lawrence		235.2	225.2	293.6	273.5	-	-	-	-	-
Mallard		223.7	212.4	338.2	274.2	-	-	-	-	-
Charles Lehman		260.1	241.9	348.8	312.3	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	204.0	188.1	292.8	268.0	391.9	281.9	-	-	-
Mr. Paul		206.3	189.1	305.5	252.1	398.0	278.4	-	-	-
Exxon St. Louis		233.9	225.6	321.7	291.8	372.3	383.0	-	-	-
Margaret O		261.7	253.6	322.8	293.1	374.6	293.7	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	185.2	193.7	236.8	208.6	275.6	236.5	-	-	-
Ste. Genevieve		249.4	221.4	-	-	321.7	284.6	406.0	306.4	423.8
Nicole Brent	10/17/90	236.5	247.2	249.8	221.3	-	-	-	-	-
Frank H. Peavey		200.9	203.1	257.3	231.2	-	-	-	-	-

Kampsville Site, Trip 1

90 Minutes after Barge-Tow Passage

Tow name	Date	*Suspended Sediment Concentration, mg/L*								
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	113.7	110.1	196.0	177.9	237.8	-	-	-	-
Floyd Blaske		116.1	109.7	203.2	182.9	236.5	-	-	-	-
Luke Burton	10/13/90	213.6	184.4	275.2	249.0	334.2	264.2	-	-	-
Sugarland		223.6	203.4	279.9	249.3	321.3	260.9	-	-	-
William C. Norman		178.7	154.6	233.7	316.2	295.3	241.3	-	-	-
Frank H. Peavey		268.6	224.9	-	-	378.3	286.9	-	-	-
Conti-Karla		-	-	-	-	-	-	-	-	-
Mr. Paul	10/14/90	301.5	299.8	305.0	300.7	-	-	-	-	-
Rambler		276.9	213.3	320.4	264.7	-	-	-	-	-
Mr. Lawrence		218.3	199.0	391.6	262.7	-	-	-	-	-
Mallard		301.9	281.4	357.1	296.4	-	-	-	-	-
Charles Lehman		-	-	348.4	317.0	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	199.7	182.3	283.7	259.3	412.0	281.5	-	-	-
Mr. Paul		203.5	189.9	302.2	279.0	360.1	286.4	-	-	-
Exxon St. Louis		283.4	274.5	324.6	295.5	413.9	413.2	-	-	-
Margaret O		303.6	300.7	325.7	296.9	483.7	402.5	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	200.0	176.7	239.5	207.5	284.2	227.8	-	-	-
Ste. Genevieve		265.5	231.0	-	-	-	-	406.5	-	-
Nicole Brent	10/17/90	206.5	206.0	256.3	228.0	-	-	-	-	-
Frank H. Peavey		206.7	205.4	248.6	233.2	-	-	-	-	-

Kampsville Site, Trip 1

120 Minutes after Barge-Tow Passage

		Suspended Sediment Concentration, mg/L								
Tow name	*Date*	*Station a1*	*Station a2*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station d2*	*Station d3*
Mr. Aldo	10/12/90	113.5	109.6	213.8	181.2	246.4	-	-	-	-
Floyd Blaske		118.1	125.4	212.7	191.3	251.0	-	-	-	-
Luke Burton	10/13/90	191.5	177.0	260.9	293.4	322.3	262.0	-	-	-
Sugarland		211.5	192.6	261.6	334.5	315.2	251.8	-	-	-
William C. Norman		173.6	162.2	259.7	314.0	303.0	246.3	-	-	-
Frank H. Peavey		230.5	206.4	-	-	416.0	294.7	-	-	-
Conti-Karla		-	-	-	-	-	-	-	-	-
Mr. Paul	10/14/90	249.2	230.0	305.5	268.4	-	-	-	-	-
Rambler		230.0	208.5	303.7	268.0	-	-	-	-	-
Mr. Lawrence		565.4	434.4	333.2	307.7	-	-	-	-	-
Mallard		261.4	244.8	348.4	315.2	-	-	-	-	-
Charles Lehman		-	-	-	-	-	-	-	-	-
Nicholas Duncan		-	-	-	-	-	-	-	-	-
Ardyce Randall	10/15/90	197.5	177.0	280.0	238.0	356.4	278.7	-	-	-
Mr. Paul		194.0	183.8	299.6	270.0	366.3	298.6	-	-	-
Exxon St. Louis		272.7	262.7	327.5	299.3	423.2	336.1	-	-	-
Margaret O		243.8	264.1	327.6	294.9	415.7	332.7	-	-	-
Mr. Lawrence		-	-	-	-	-	-	-	-	-
A. L. Smith	10/16/90	196.3	178.3	238.4	212.8	266.9	229.5	-	-	-
Ste. Genevieve		-	-	-	-	-	-	-	-	-
Nicole Brent	10/17/90	202.1	201.6	251.5	224.5	-	-	-	-	-
Frank H. Peavey		-	-	-	-	-	-	-	-	-

APPENDIX XVII.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR CLARKS FERRY, TRIP 1

Clarks Ferry Site, Trip 1

60 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		123.8	122.4	147.5	122.4	-	174.0	161.3	156.1
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	150.7	161.1	158.6	153.6	204.2	194.5	192.5
Conti-Afton		166.7	-	-	-	-	-	197.7	-
Jack D. Wofford		159.1	155.9	173.4	172.6	171.8	209.8	207.4	202.1
Donnie Ray Jr. (2)	5/20/91	-	-	156.4	-	-	173.5	-	-
Sunflower (1)		-	-	-	-	-	-	-	-
American Beauty (1)		-	-	171.9	-	-	160.1	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	-	-	-	-	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	166.1	-	-	-	-	-
Hornet		-	-	-	-	-	-	-	-
Volunteer State		-	-	127.0	-	-	129.0	-	-

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Clarks Ferry Site, Trip 1

30 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		148.8	145.9	161.1	144.8	-	176.9	164.9	158.9
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	147.3	164.4	159.3	154.7	204.5	192.5	193.4
Conti-Afton		145.0	142.3	163.0	157.6	158.8	194.3	189.0	190.5
Jack D. Wofford		167.2	160.1	168.0	165.9	166.0	213.0	207.7	222.5
Donnie Ray Jr. (2)	5/20/91	-	-	148.9	-	-	174.6	-	-
Sunflower (1)		-	-	157.3	-	-	-	-	-
American Beauty (1)		-	-	183.4	-	-	175.6	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	-	-	-	-	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	167.9	-	-	149.6	-	-
Hornet		-	-	137.1	-	-	138.4	-	-
Volunteer State		-	-	123.6	-	-	127.0	-	-

Clarks Ferry Site, Trip 1

10 Minutes Prior to Barge-Tow Passage

		Suspended Sediment Concentration, mg/L							
Tow name	*Date*	*Station a1*	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		170.1	157.9	180.8	164.3	-	185.9	188.9	249.6
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	140.4	157.9	153.3	152.3	193.5	182.0	188.3
Conti-Afton		150.2	142.0	163.0	159.5	161.0	202.3	199.3	200.3
Jack D. Wofford		160.2	158.1	174.1	178.5	180.4	217.2	215.9	214.8
Donnie Ray Jr. (2)	5/20/91	-	-	150.8	-	-	170.4	-	-
Sunflower (1)		-	-	185.6	-	-	189.6	-	-
American Beauty (1)		-	-	195.0	-	-	172.4	-	-
Sierra Dawn	5/21/91	-	-	142.0	-	-	140.9	-	-
Cooperative Vanguard		-	-	143.1	-	-	136.5	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	171.9	-	-	141.8	-	-
Hornet		-	-	132.5	-	-	131.8	-	-
Volunteer State		-	-	120.9	-	-	126.5	-	-

Clarks Ferry Site, Trip 1

5 Minutes Prior to Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		176.9	160.6	185.7	169.2	-	188.1	194.8	272.2
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	139.0	156.2	154.1	151.3	191.3	181.1	183.1
Conti-Afton		153.8	140.6	163.6	155.4	157.2	196.4	196.3	199.8
Jack D. Wofford		158.4	157.6	175.6	181.6	184.0	218.3	217.9	212.9
Donnie Ray Jr. (2)	5/20/91	-	-	151.3	-	-	169.4	-	-
Sunflower (1)		-	-	183.8	-	-	185.5	-	-
American Beauty (1)		-	-	200.0	-	-	173.1	-	-
Sierra Dawn	5/21/91	-	-	135.8	-	-	139.7	-	-
Cooperative Vanguard		-	-	138.8	-	-	137.7	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	172.9	-	-	139.9	-	-
Hornet		-	-	130.1	-	-	132.4	-	-
Volunteer State		-	-	114.8	-	-	128.6	-	-

Clarks Ferry Site, Trip 1

2 Minutes Prior to Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		175.2	157.3	183.6	172.1	-	192.3	187.5	285.8
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	139.1	156.8	159.8	150.5	192.0	184.6	176.5
Conti-Afton		156.0	139.7	164.0	152.9	154.9	192.8	194.5	199.6
Jack D. Wofford		157.3	157.3	180.1	183.5	186.2	218.9	209.4	211.7
Donnie Ray Jr. (2)	5/20/91	-	-	151.5	-	-	168.7	-	-
Sunflower (1)		-	-	183.7	-	-	181.9	-	-
American Beauty (1)		-	-	203.0	-	-	173.6	-	-
Sierra Dawn	5/21/91	-	-	132.0	-	-	138.9	-	-
Cooperative Vanguard		-	-	147.0	-	-	142.8	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	159.0	-	-	139.8	-	-
Hornet		-	-	134.6	-	-	131.7	-	-
Volunteer State		-	-	116.0	-	-	130.9	-	-

Clarks Ferry Site, Trip 1

Peak Suspended Sediment Concentrations

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Station b1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		179.1	163.0	187.6	174.2	-	193.9	196.0	294.9
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	152.4	174.3	171.4	169.4	198.6	198.0	189.8
Conti-Afton		156.0	161.2	176.4	171.3	166.3	210.0	201.9	200.4
Jack D. Wofford		179.2	170.2	190.2	184.7	187.6	220.0	221.7	224.0
Donnie Ray Jr. (2)	5/20/91	-	-	167.3	-	-	186.4	-	-
Sunflower (1)		-	-	192.9	-	-	189.6	-	-
American Beauty (1)		-	-	211.1	-	-	185.9	-	-
Sierra Dawn	5/21/91	-	-	142.0	-	-	140.9	-	-
Cooperative Vanguard		-	-	200.8	-	-	142.8	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	172.9	-	-	145.4	-	-
Hornet		-	-	139.3	-	-	138.0	-	-
Volunteer State		-	-	209.6	-	-	144.4	-	-

Clarks Ferry Site, Trip 1

Average Suspended Sediment Concentrations

		Average Suspended Sediment Concentration during Event, mg/L							
Tow name	*Date*	*Station a1*	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		167.4	153.1	181.6	-	-	-	179.0	227.1
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	-	-	-	-	-	-	-
Conti-Afton		150.8	-	164.2	-	-	-	-	199.4
Jack D. Wofford		-	-	-	-	-	219.4	216.7	198.5
Donnie Ray Jr. (2)	5/20/91	-	-	-	-	-	-	-	-
Sunflower (1)		-	-	183.5	-	-	179.6	-	-
American Beauty (1)		-	-	-	-	-	-	-	-
Sierra Dawn	5/21/91	-	-	137.6	-	-	138.3	-	-
Cooperative Vanguard		-	-	-	-	-	137.5	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	148.3	-	-	-	-	-
Hornet	-	-	-	-	-	-	-	-	-
Volunteer State	-	-	-	-	-	-	-	-	-

Clarks Ferry Site, Trip 1

2 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		159.6	163.0	173.7	174.1	-	192.3	180.3	267.8
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	142.0	161.2	158.1	149.8	189.0	187.1	183.9
Conti-Afton		154.9	139.0	165.3	156.1	157.5	194.0	196.7	196.8
Jack D. Wofford		155.0	159.4	183.4	181.7	176.2	217.8	212.3	205.2
Donnie Ray Jr. (2)	5/20/91	-	-	151.6	-	-	186.4	-	-
Sunflower (1)		-	-	182.6	-	-	178.1	-	-
American Beauty (1)		-	-	190.0	-	-	177.1	-	-
Sierra Dawn	5/21/91	-	-	139.7	-	-	128.8	-	-
Cooperative Vanguard		-	-	144.9	-	-	140.2	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	150.9	-	-	145.4	-	-
Hornet		-	-	132.3	-	-	137.6	-	-
Volunteer State		-	-	126.4	-	-	138.6	-	-

Clarks Ferry Site, Trip 1

5 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentrations, mg/L							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		151.2	145.1	167.6	171.9	-	192.1	179.5	227.1
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	145.2	159.6	162.2	154.8	194.7	194.4	184.6
Conti-Afton		167.3	153.1	166.4	163.9	164.0	203.5	199.4	195.5
Jack D. Wofford		173.0	163.7	187.2	182.3	172.7	215.5	203.6	204.2
Donnie Ray Jr. (2)	5/20/91	-	-	161.0	-	-	180.1	-	-
Sunflower (1)		-	-	181.3	-	-	175.9	-	-
American Beauty (1)		-	-	199.2	-	-	176.8	-	-
Sierra Dawn	5/21/91	-	-	139.9	-	-	135.1	-	-
Cooperative Vanguard		-	-	140.0	-	-	134.9	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	150.1	-	-	139.9	-	-
Hornet		-	-	134.7	-	-	136.7	-	-
Volunteer State		-	-	127.1	-	-	139.7	-	-

Clarks Ferry Site, Trip 1

30 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		139.3	136.6	162.4	162.3	-	185.4	173.8	270.3
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	151.8	170.8	175.0	165.8	196.0	198.6	195.5
Conti-Afton		155.4	151.8	180.6	173.0	171.8	201.1	199.8	195.9
Jack D. Wofford		183.2	159.8	194.2	179.7	181.9	220.1	208.6	209.6
Donnie Ray Jr. (2)	5/20/91	-	-	179.2	-	-	-	-	-
Sunflower (1)		-	-	174.6	-	-	178.1	-	-
American Beauty (1)		-	-	201.7	-	-	183.1	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	135.8	-	-	139.4	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	141.1	-	-	140.2	-	-
Hornet		-	-	136.3	-	-	132.8	-	-
Volunteer State		-	-	166.7	-	-	154.3	-	-

Clarks Ferry Site, Trip 1

60 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		-	132.3	141.3	-	-	183.0	166.0	208.1
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	143.1	163.0	156.9	157.8	-	186.1	-
Conti-Afton		160.1	156.2	173.6	170.9	171.7	202.1	199.5	194.6
Jack D. Wofford		165.0	160.2	181.9	174.4	168.4	200.7	201.7	195.6
Donnie Ray Jr. (2)	5/20/91	-	-	-	-	-	-	-	-
Sunflower (1)		-	-	168.8	-	-	131.9	-	-
American Beauty (1)		-	-	186.2	-	-	176.1	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	151.4	-	-	142.5	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	133.3	-	-	-	-	-
Hornet		-	-	143.5	-	-	130.6	-	-
Volunteer State		-	-	149.5	-	-	141.2	-	-

Clarks Ferry Site, Trip 1

90 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		-	-	-	-	-	-	-	-
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	-	-	155.4	-	-	-	-
Conti-Afton		161.8	151.0	168.6	166.1	172.1	205.0	185.8	201.5
Jack D. Wofford		158.7	154.7	190.3	176.9	179.5	210.2	297.4	199.0
Donnie Ray Jr. (2)	5/20/91	-	-	-	-	-	-	-	-
Sunflower (1)		-	-	163.3	-	-	161.9	-	-
American Beauty (1)		-	-	173.9	-	-	167.5	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	165.9	-	-	149.4	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	-	-	-	-	-	-
Hornet		-	-	127.4	-	-	129.2	-	-
Volunteer State		-	-	-	-	-	-	-	-

Clarks Ferry Site, Trip 1

120 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station a2*	*Stationb1*	*Station b2*	*Station b3*	*Station c1*	*Station c2*	*Station c3*
C.W. Rushing (1)	5/16/91	-	-	-	-	-	-	-	-
Donnie Ray Jr. (1)		-	-	-	-	-	-	-	-
Samantha		-	-	-	-	-	-	-	-
C.W. Rushing (2)	5/17/91	-	-	-	-	-	-	-	-
Jemco Towing		-	-	-	-	-	-	-	-
T.S. Kunsmann		-	-	-	-	-	-	-	-
Dell Butcher (1)		-	-	-	-	-	-	-	-
Pearl B.	5/19/91	-	-	-	-	-	-	-	-
Conti-Afton		157.5	154.4	171.0	167.1	168.8	206.1	210.3	204.9
Jack D. Wofford		-	170.1	179.3	-	178.6	-	198.8	194.8
Donnie Ray Jr. (2)	5/20/91	-	-	-	-	-	-	-	-
Sunflower (1)		-	-	160.4	-	-	135.6	-	-
American Beauty (1)		-	-	-	-	-	-	-	-
Sierra Dawn	5/21/91	-	-	-	-	-	-	-	-
Cooperative Vanguard		-	-	166.1	-	-	149.6	-	-
Cindy J. Erickson		-	-	-	-	-	-	-	-
Frank H. Peavy		-	-	-	-	-	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Sunflower (2)		-	-	-	-	-	-	-	-
Dell Butcher (2)		-	-	-	-	-	-	-	-
Hornet		-	-	125.5	-	-	128.3	-	-
Volunteer State		-	-	-	-	-	-	-	-

APPENDIX XVIII.

SUSPENDED SEDIMENT CONCENTRATION DATA FOR GOOSE ISLAND, TRIP 2

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Goose Island Site, Trip 2

60 Minutes before Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		-	-	-	-	-	-	-	-
Helen M. Clements		130.0	117.6	105.5	119.0	124.6	-	-	-
Elizabeth Ann		115.2	108.2	110.5	119.5	127.6	-	-	-
Frank T. Heffelfinger	7/19/91	89.3	93.4	85.5	114.9	73.2	-	-	-
Queen City		102.3	94.6	80.6	68.9	58.6	-	-	-
Helen M. Clements		104.3	71.0	121.2	71.1	66.9	-	-	-
Frank T. Heffelfinger		101.4	89.0	129.3	75.9	73.2	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	123.5	133.5	-	-	-	-	-
Lil Charley		-	124.7	131.1	-	-	-	-	-
C.W. Rushing		-	164.7	184.3	-	-	-	-	-
Conti-Nan		-	121.4	121.5	-	-	-	135.9	140.0
Mary L		-	117.1	119.9	-	-	-	109.0	138.1
Scarlet Knight	7/21/91	-	126.4	117.4	-	-	-	-	-
Conti-Karla		-	274.5	271.5	-	-	-	88.5	133.7

Goose Island Site, Trip 2

60 Minutes before Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	-	-	-	-	-	-	-
Cooperative Ambassador		-	124.9	103.0	-	-	-	69.4	69.8
Eastern		-	127.4	104.7	-	-	-	68.9	71.1
Sam M. Fleming		-	129.3	106.0	-	-	-	68.6	72.1
Kevin Michael		-	111.7	115.9	-	-	56.6	70.1	69.0
A.M. Thompson	7/23/91	-	74.1	67.6	-	-	63.5	66.7	71.3
Susan Elizabeth		-	72.6	67.9	-	-	63.2	65.9	71.6
Lil Charley		-	72.6	67.9	-	-	63.2	65.9	71.6
Badger		-	150.8	145.9	-	-	64.2	65.8	68.0
Kay D		-	150.5	132.0	-	-	65.2	68.6	68.9
Evey-T		-	104.4	97.6	-	-	60.0	65.4	69.0
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

30 Minutes before Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		-	-	-	-	-	-	-	-
Helen M. Clements		120.6	109.3	110.0	120.0	126.4	-	-	-
Elizabeth Ann		117.8	95.6	79.5	126.8	126.3	-	-	-
Frank T. Heffelfinger	7/19/91	87.9	109.8	97.0	113.0	78.7	-	-	-
Queen City		77.8	74.9	91.2	70.5	46.6	-	-	-
Helen M. Clements		103.1	71.5	121.1	95.1	74.9	-	-	-
Frank T. Heffelfinger		100.0	74.2	117.9	92.2	76.8	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	129.5	132.1	-	-	-	-	-
Lil Charley		-	142.6	140.0	-	-	-	-	-
C.W. Rushing		-	161.2	167.0	-	-	-	-	-
Conti-Nan		-	129.3	132.0	-	-	-	124.6	136.8
Mary L		-	99.0	96.9	-	-	-	111.7	122.1
Scarlet Knight	7/21/91	-	162.7	151.5	-	-	-	-	-
Conti-Karla		-	160.5	144.1	-	-	-	84.2	102.7

Goose Island Site, Trip 2

30 Minutes before Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	-	-	-	-	-	-	-
Cooperative Ambassador		-	119.6	113.2	-	-	-	65.8	71.5
Eastern		-	116.7	114.4	-	-	-	67.2	70.6
Sam M. Fleming		-	114.6	115.2	-	-	-	68.3	70.0
Kevin Michael		-	265.9	183.1	-	-	68.2	67.8	67.3
A.M. Thompson	7/23/91	-	73.4	69.6	-	-	63.9	66.8	71.5
Susan Elizabeth		-	75.1	70.5	-	-	64.5	67.9	71.2
Lil Charley		-	75.1	70.5	-	-	64.5	67.9	71.2
Badger		-	109.0	105.3	-	-	60.5	65.4	69.2
Kay D		-	122.7	128.5	-	-	62.2	65.5	69.7
Evey-T		-	92.5	88.8	-	-	62.2	64.8	68.1
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

10 Minutes before Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		-	-	-	-	-	-	-	-
Helen M. Clements		100.9	114.5	110.2	116.9	130.3	-	-	-
Elizabeth Ann		113.6	88.5	90.2	87.2	82.8	-	-	-
Frank T. Heffelfinger	7/19/91	76.6	93.0	103.5	111.8	83.4	-	-	-
Queen City		71.9	73.1	74.0	78.7	57.7	-	-	-
Helen M. Clements		90.0	72.8	117.6	82.2	74.0	-	-	-
Frank T. Heffelfinger		98.9	86.7	129.0	71.2	73.5	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	145.9	141.9	-	-	-	-	-
Lil Charley		-	134.6	146.0	-	-	-	-	-
C.W. Rushing		-	145.6	155.5	-	-	-	-	-
Conti-Nan		-	131.2	129.1	-	-	-	132.4	129.1
Mary L		-	87.1	100.2	-	-	-	112.9	118.5
Scarlet Knight	7/21/91	-	141.5	141.4	-	-	-	-	-
Conti-Karla		-	159.4	158.5	-	-	-	85.9	105.5

Goose Island Site, Trip 2

10 Minutes before Barge-Tow Passage (Concluded)

		Suspended Sediment Concentration, mg/L							
Tow name	***Date***	***Station a1***	***Station b1***	***Station b2***	***Station c1***	***Station c2***	***Station d1***	***Station e1***	***Station e2***
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	115.3	96.5	-	-	-	-	-
Cooperative Ambassador		-	116.7	110.6	-	-	61.8	69.9	69.4
Eastern		-	119.6	107.6	-	-	64.7	69.7	69.7
Sam M. Fleming		-	121.7	105.3	-	-	66.9	69.6	69.8
Kevin Michael		-	169.6	144.0	-	-	71.9	68.3	77.6
A.M. Thompson	7/23/91	-	84.8	86.4	-	-	65.9	68.5	71.7
Susan Elizabeth		-	105.0	126.3	-	-	64.7	67.0	74.3
Lil Charley		-	105.0	126.3	-	-	64.7	67.0	74.3
Badger		-	109.3	93.8	-	-	62.1	60.3	69.6
Kay D		-	103.1	82.3	-	-	62.1	58.0	69.7
Evey-T		-	110.6	88.0	-	-	62.6	64.2	69.3
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

5 Minutes before Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		127.6	133.2	106.1	122.2	143.3	-	-	-
Helen M. Clements		94.9	117.2	110.1	115.8	131.4	-	-	-
Elizabeth Ann		123.9	101.3	90.6	105.5	78.5	-	-	-
Frank T. Heffelfinger	7/19/91	73.8	88.8	105.1	111.5	84.6	-	-	-
Queen City		70.4	72.6	69.7	80.8	60.5	-	-	-
Helen M. Clements		85.0	72.1	117.5	77.3	72.6	-	-	-
Frank T. Heffelfinger		88.4	80.2	116.6	75.3	70.6	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	142.4	143.2	-	-	-	-	-
Lil Charley		-	131.1	147.3	-	-	-	-	-
C.W. Rushing		-	141.6	152.6	-	-	-	-	-
Conti-Nan		-	131.6	128.0	-	-	-	134.8	127.0
Mary L		-	84.6	105.3	-	-	-	110.7	117.9
Scarlet Knight	7/21/91	-	148.2	145.7	-	-	-	-	-
Conti-Karla		-	161.4	165.2	-	-	-	86.8	107.4

Goose Island Site, Trip 2

5 Minutes before Barge-Tow Passage (Concluded)

		Suspended Sediment Concentration, mg/L								
Tow name	*Date*	*Station a1*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	118.5	98.7	-	-	-	-	-
Cooperative Ambassador		-	120.3	106.8	-	-	65.4	69.7	69.7
Eastern		-	133.7	103.8	-	-	65.6	68.8	70.6
Sam M. Fleming		-	135.0	102.0	-	-	65.9	67.8	69.1
Kevin Michael		-	135.6	137.3	-	-	68.2	69.2	73.8
A.M. Thompson	7/23/91	-	97.9	111.3	-	-	67.0	66.4	73.9
Susan Elizabeth		-	90.7	105.6	-	-	63.3	61.6	69.9
Lil Charley		-	90.7	105.6	-	-	63.3	61.6	69.9
Badger		-	94.7	80.3	-	-	62.1	60.8	69.0
Kay D		-	82.1	77.4	-	-	62.2	65.0	67.9
Evey-T		-	157.6	87.3	-	-	62.0	65.4	74.4
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

2 Minutes before Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		131.0	131.0	108.2	128.0	148.6	-	-	-
Helen M. Clements		86.0	106.0	94.7	113.0	130.3	-	-	-
Elizabeth Ann		112.4	97.3	86.5	113.7	76.6	-	-	-
Frank T. Heffelfinger	7/19/91	91.8	90.7	85.7	111.4	97.1	-	-	-
Queen City		76.1	76.7	69.0	74.1	60.6	-	-	-
Helen M. Clements		91.2	85.6	117.4	73.2	71.8	-	-	-
Frank T. Heffelfinger		108.7	86.2	123.6	93.8	75.9	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	140.3	144.0	-	-	-	-	-
Lil Charley		-	128.9	148.1	-	-	-	-	-
C.W. Rushing		-	139.3	150.9	-	-	-	-	-
Conti-Nan		-	128.1	127.4	-	-	-	134.6	135.3
Mary L		-	109.6	127.2	-	-	-	108.8	109.7
Scarlet Knight	7/21/91	-	152.2	148.3	-	-	-	-	-
Conti-Karla		-	162.7	169.2	-	-	-	87.2	108.6

Goose Island Site, Trip 2

2 Minutes before Barge-Tow Passage (Concluded)

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	120.4	100.0	-	-	-	-	-
Cooperative Ambassador		-	122.4	104.6	-	-	67.6	69.6	69.9
Eastern		-	135.0	102.0	-	-	65.9	67.8	69.1
Sam M. Fleming		-	113.3	105.8	-	-	66.8	69.1	69.4
Kevin Michael		-	125.4	116.5	-	-	68.0	69.0	69.0
A.M. Thompson	7/23/91	-	105.0	126.3	-	-	64.7	67.0	74.3
Susan Elizabeth		-	132.6	88.7	-	-	63.8	66.7	72.6
Lil Charley		-	132.6	88.7	-	-	63.8	66.7	72.6
Badger		-	82.1	77.4	-	-	62.2	65.0	67.9
Kay D		-	113.3	111.7	-	-	62.3	64.5	68.6
Evey-T		-	154.5	91.1	-	-	64.9	65.8	74.5
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

Peak Suspended Sediment Concentrations

Tow name	Date	Peak Suspended Sediment Concentration, mg/L							
		Station a1	Station b1	Station b2	Station c1	Station c2	Station d1	Station e1	Station e2
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		148.3	133.2	113.2	131.8	153.8	-	-	-
Helen M. Clements		120.0	117.7	110.1	122.8	136.5	-	-	-
Elizabeth Ann		123.9	101.3	90.6	123.7	79.1	-	-	-
Frank T. Heffelfinger	7/19/91	104.0	110.0	109.8	124.8	97.1	-	-	-
Queen City		92.8	92.1	88.2	93.3	61.6	-	-	-
Helen M. Clements		99.4	99.3	129.0	77.3	73.5	-	-	-
Frank T. Heffelfinger		111.1	104.9	135.6	103.4	79.5	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	142.4	145.8	-	-	-	-	-
Lil Charley		-	131.1	150.8	-	-	-	-	-
C.W. Rushing		-	150.1	161.6	-	-	-	-	-
Conti-Nan		-	131.7	128.0	-	-	-	135.7	139.3
Mary L		-	147.8	158.5	-	-	-	110.7	122.7
Scarlet Knight	7/21/91	-	161.5	154.4	-	-	-	-	-
Conti-Karla		-	163.1	184.3	-	-	-	91.9	129.3

Goose Island Site, Trip 2

Peak Suspended Sediment Concentrations (Concluded)

Tow name	Date	Peak Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	124.9	103.0	-	-	-	-	-
Cooperative Ambassador		-	145.0	106.8	-	-	67.6	69.7	71.3
Eastern		-	254.2	183.6	-	-	70.3	73.8	71.3
Sam M. Fleming		-	280.0	231.2	-	-	71.6	73.8	70.3
Kevin Michael		-	142.3	150.8	-	-	69.1	77.1	73.8
A.M. Thompson	7/23/91	-	164.7	126.3	-	-	67.4	68.5	74.7
Susan Elizabeth		-	164.7	109.5	-	-	70.0	69.8	72.7
Lil Charley		-	164.7	109.5	-	-	70.0	69.8	72.7
Badger		-	153.0	150.5	-	-	62.4	65.0	69.4
Kay D		-	181.3	174.3	-	-	62.5	65.1	69.8
Evey-T		-	157.6	95.9	-	-	65.9	66.8	78.2
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

Average Suspended Sediment Concentrations

		Average Suspended Sediment Concentration, mg/L							
Tow name	*Date*	*Station a1*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		105.8	129.6	109.6	131.8	152.1	-	-	-
Helen M. Clements		120.0	108.4	86.8	111.4	124.3	-	-	-
Elizabeth Ann		97.9	83.4	84.8	123.7	75.6	-	-	-
Frank T. Heffelfinger	7/19/91	87.4	98.3	99.4	111.1	86.8	-	-	-
Queen City		92.8	85.1	72.4	75.5	60.7	-	-	-
Helen M. Clements		98.9	86.7	129.0	71.2	73.5	-	-	-
Frank T. Heffelfinger		107.3	74.5	135.6	102.2	75.6	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	138.8	144.5	-	-	-	-	-
Lil Charley		-	127.5	148.6	-	-	-	-	-
C.W. Rushing		-	131.6	156.0	-	-	-	-	-
Conti-Nan		-	120.8	116.7	-	-	-	129.7	139.3
Mary L		-	135.1	148.1	-	-	-	107.5	115.8
Scarlet Knight	7/21/91	-	154.8	150.0	-	-	-	-	-
Conti-Karla		-	160.3	164.4	-	-	-	90.6	108.8

Goose Island Site, Trip 2

Average Suspended Sediment Concentrations (Concluded)

Tow name	Date	Average Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	121.7	100.8	-	-	-	-	-
Cooperative Ambassador		-	145.0	105.8	-	-	63.6	67.9	71.3
Eastern		-	113.6	101.0	-	-	65.7	68.1	69.1
Sam M. Fleming		-	178.0	112.8	-	-	68.4	72.0	70.0
Kevin Michael		-	131.2	117.7	-	-	68.4	68.4	68.3
A.M. Thompson	7/23/91	-	105.4	113.0	-	-	62.2	67.3	72.2
Susan Elizabeth		-	99.4	109.5	-	-	65.0	66.9	72.2
Lil Charley		-	99.4	109.5	-	-	65.0	66.9	72.2
Badger		-	102.9	100.3	-	-	62.3	64.6	68.4
Kay D		-	134.1	134.6	-	-	62.4	64.1	69.1
Evey-T		-	152.6	92.9	-	-	64.4	66.2	75.2
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

2 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		105.8	128.1	111.1	124.2	152.3	-	-	-
Helen M. Clements		102.6	113.6	97.6	115.7	124.4	-	-	-
Elizabeth Ann		97.6	83.8	84.4	89.5	71.6	-	-	-
Frank T. Heffelfinger	7/19/91	104.0	106.2	108.1	112.0	76.9	-	-	-
Queen City		76.2	83.9	88.2	86.2	61.3	-	-	-
Helen M. Clements		93.8	73.7	118.9	74.0	65.4	-	-	-
Frank T. Heffelfinger		104.8	78.6	131.8	100.0	77.1	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	137.4	145.0	-	-	-	-	-
Lil Charley		-	126.1	149.1	-	-	-	-	-
C.W. Rushing		-	140.8	155.4	-	-	-	-	-
Conti-Nan		-	112.7	123.0	-	-	-	127.2	136.8
Mary L		-	139.3	131.7	-	-	-	-	121.6
Scarlet Knight	7/21/91	-	157.5	151.8	-	-	-	-	-
Conti-Karla		-	145.2	135.5	-	-	-	81.5	114.1

Goose Island Site, Trip 2

2 Minutes after Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	Station b1	Station b2	Station c1	Station c2	Station d1	Station e1	Station e2
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	123.0	101.7	-	-	-	-	-
Cooperative Ambassador		-	135.0	102.0	-	-	65.9	67.8	69.1
Eastern		-	112.9	109.3	-	-	67.9	70.1	69.7
Sam M. Fleming		-	254.2	183.6	-	-	70.3	71.3	68.6
Kevin Michael		-	142.3	124.7	-	-	67.4	67.4	68.1
A.M. Thompson	7/23/91	-	97.4	103.2	-	-	62.9	63.9	70.3
Susan Elizabeth		-	100.5	93.0	-	-	67.9	66.5	69.6
Lil Charley		-	100.5	93.0	-	-	67.9	66.5	69.6
Badger		-	123.7	123.2	-	-	62.4	64.3	68.9
Kay D		-	153.0	150.5	-	-	62.4	64.5	69.4
Evey-T		-	150.7	94.1	-	-	61.5	66.5	76.5
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

5 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		108.3	125.9	113.2	121.8	148.0	-	-	-
Helen M. Clements		95.2	106.5	107.1	118.9	136.5	-	-	-
Elizabeth Ann		100.5	90.3	88.3	78.5	78.8	-	-	-
Frank T. Heffelfinger	7/19/91	79.7	88.9	96.4	101.7	72.2	-	-	-
Queen City		84.3	73.3	69.4	92.9	61.6	-	-	-
Helen M. Clements		88.4	80.2	116.6	75.3	70.6	-	-	-
Frank T. Heffelfinger		109.0	104.9	132.6	84.3	77.0	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	135.3	145.8	-	-	-	-	-
Lil Charley		-	126.0	150.8	-	-	-	-	-
C.W. Rushing		-	150.1	129.7	-	-	-	-	-
Conti-Nan		-	101.3	104.7	-	-	-	134.9	134.7-
Mary L		-	144.4	131.8	-	-	-	-	119.7
Scarlet Knight	7/21/91	-	161.5	154.4	-	-	-	-	-
Conti-Karla		-	151.1	164.1	-	-	-	89.8	129.3

Goose Island Site, Trip 2

5 Minutes after Barge-Tow Passage (Concluded)

		Suspended Sediment Concentration, mg/L							
Tow name	*Date*	*Station a1*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	124.9	103.0	-	-	-	-	-
Cooperative Ambassador		-	113.3	105.8	-	-	66.8	69.1	69.4
Eastern		-	254.2	183.6	-	-	70.3	71.3	68.6
Sam M. Fleming		-	280.0	207.2	-	-	70.3	68.1	65.9
Kevin Michael		-	123.7	131.8	-	-	66.8	77.1	69.2
A.M. Thompson	7/23/91	-	164.7	98.3	-	-	63.5	63.6	72.4
Susan Elizabeth		-	101.6	90.3	-	-	61.9	64.9	72.2
Lil Charley		-	101.6	90.3	-	-	61.9	64.9	72.2
Badger		-	153.0	150.5	-	-	62.4	64.5	69.4
Kay D		-	181.3	174.3	-	-	62.5	65.1	69.8
Evey-T		-	148.0	95.9	-	-	59.5	66.5	78.2
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

30 Minutes after Barge-Tow Passage

		Suspended Sediment Concentration, mg/L							
Tow name	*Date*	*Station a1*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		122.0	125.3	116.3	113.1	133.8	-	-	-
Helen M. Clements		101.1	105.3	90.9	97.3	79.9	-	-	-
Elizabeth Ann		115.3	106.6	112.6	131.6	95.9	-	-	-
Frank T. Heffelfinger	7/19/91	74.4	102.8	87.9	66.0	65.0	-	-	-
Queen City		105.3	77.8	131.5	87.0	62.7	-	-	-
Helen M. Clements		205.7	163.5	145.3	119.9	133.6	-	-	-
Frank T. Heffelfinger		169.6	105.0	120.2	120.4	123.4	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	138.1	161.4	-	-	-	-	-
Lil Charley		-	159.5	180.2	-	-	-	-	-
C.W. Rushing		-	153.2	147.3	-	-	-	-	-
Conti-Nan		-	104.1	86.7	-	-	-	139.4	118.1
Mary L		-	105.6	124.9	-	-	-	-	140.9
Scarlet Knight	7/21/91	-	214.7	204.5	-	-	-	-	-
Conti-Karla		-	118.0	118.6	-	-	-	81.5	96.6

Goose Island Site, Trip 2

30 Minutes after Barge-Tow Passage (Concluded)

Tow name	*Date*	*Suspended Sediment Concentration, mg/L* *Station a1*	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	123.2	111.8	-	-	-	-	-
Cooperative Ambassador		-	209.3	178.6	-	-	71.1	67.2	72.4
Eastern		-	162.5	146.0	-	-	73.7	66.6	80.1
Sam M. Fleming		-	138.1	130.2	-	-	66.4	68.8	83.8
Kevin Michael		-	108.9	118.8	-	-	94.3	72.7	68.6
A.M. Thompson	7/23/91	-	139.0	109.5	-	-	61.6	64.1	69.7
Susan Elizabeth		-	147.3	137.8	-	-	61.7	63.9	72.3
Lil Charley		-	147.3	137.8	-	-	61.7	63.9	72.3
Badger		-	151.7	93.5	-	-	62.9	66.3	75.8
Kay D		-	148.9	95.3	-	-	58.5	66.8	77.7
Evey-T		-	97.7	79.3	-	-	-	-	-
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

60 Minutes after Barge-Tow Passage

Tow name	*Date*	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		187.5	223.6	172.6	115.4	127.2	-	-	-
Helen M. Clements		123.8	101.9	109.0	101.5	68.5	-	-	-
Elizabeth Ann		-	-	-	-	-	-	-	-
Frank T. Heffelfinger	7/19/91	121.1	128.9	118.3	84.5	72.2	-	-	-
Queen City		101.4	89.0	129.3	75.9	73.2	-	-	-
Helen M. Clements		185.7	85.1	109.6	123.4	128.9	-	-	-
Frank T. Heffelfinger		162.8	87.1	158.2	119.1	123.8	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	163.9	179.1	-	-	-	-	-
Lil Charley		-	162.4	169.9	-	-	-	-	-
C.W. Rushing		-	128.7	137.1	-	-	-	-	-
Conti-Nan		-	122.4	137.6	-	-	-	134.6	108.8
Mary L		-	120.5	120.2	-	-	-	-	141.7
Scarlet Knight	7/21/91	-	238.0	230.8	-	-	-	-	-
Conti-Karla		-	118.5	127.0	-	-	-	94.2	83.4

Goose Island Site, Trip 2

60 Minutes after Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	120.3	106.8	-	-	-	-	-
Cooperative Ambassador		-	85.9	110.3	-	-	65.4	67.7	69.4
Eastern		-	89.0	90.1	-	-	70.7	70.6	70.5
Sam M. Fleming		-	115.7	91.8	-	-	81.2	69.2	69.3
Kevin Michael		-	112.5	100.1	-	-	73.4	75.8	83.4
A.M. Thompson	7/23/91	-	137.9	134.4	-	-	63.5	65.6	68.6
Susan Elizabeth		-	120.8	99.3	-	-	63.2	62.7	68.0
Lil Charley		-	120.8	99.3	-	-	63.2	62.7	68.0
Badger		-	94.1	78.6	-	-	-	-	-
Kay D		-	83.3	76.5	-	-	-	-	-
Evey-T		-	-	-	-	-			
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

90 Minutes after Barge-Tow Passage

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		165.8	193.1	141.6	114.9	127.1	-	-	-
Helen M. Clements		109.8	99.8	106.6	127.8	103.4	-	-	-
Elizabeth Ann		-	-	-	-	-	-	-	-
Frank T. Heffelfinger	7/19/91	243.9	137.7	131.6	88.4	64.2	-	-	-
Queen City		100.0	74.2	117.9	92.2	76.8	-	-	-
Helen M. Clements		144.9	86.6	101.7	123.3	124.0	-	-	-
Frank T. Heffelfinger		-	-	-	-	-	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	154.2	161.8	-	-	-	-	-
Lil Charley		-	141.6	152.6	-	-	-	-	-
C.W. Rushing		-	140.5	150.8	-	-	-	-	-
Conti-Nan		-	109.4	119.9	-	-	-	110.4	146.2
Mary L		-	124.4	126.8	-	-	-	-	132.7
Scarlet Knight	7/21/91	-	156.1	147.9	-	-	-	-	-
Conti-Karla		-	127.4	134.8	-	-	-	93.0	81.1

Goose Island Site, Trip 2

90 Minutes after Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	Station b1	Station b2	Station c1	Station c2	Station d1	Station e1	Station e2
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	272.7	184.9	-	-	-	-	-
Cooperative Ambassador		-	112.1	104.9	-	-	63.3	69.6	79.2
Eastern		-	106.2	96.2	-	-	62.4	71.3	78.5
Sam M. Fleming		-	104.7	90.3	-	-	60.5	74.8	78.7
Kevin Michael		-	91.7	80.6	-	-	64.8	90.3	84.8
								63.3	
A.M. Thompson	7/23/91	-	117.6	109.2	-	-	62.1	59.4	69.4
Susan Elizabeth		-	98.9	81.3	-	-	-	59.4	-
Lil Charley		-	98.9	81.3	-	-	-	-	-
Badger		-	-	-	-	-	-	-	-
Kay D		-	-	-	-	-	-	-	-
Evey-T		-	-	-	-	-	-	-	-
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

Goose Island Site, Trip 2

120 Minutes after Barge-Tow Passage

Tow name	Date	*Suspended Sediment Concentration, mg/L*							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Ardyce Randall	7/18/91	-	-	-	-	-	-	-	-
Scarlet Knight		-	-	-	-	-	-	-	-
James F. Neal		127.2	116.9	102.9	117.4	125.7	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Elizabeth Ann		-	-	-	-	-	-	-	-
Frank T. Heffelfinger	7/19/91	109.1	97.2	91.5	78.0	63.9	-	-	-
Queen City		107.3	74.5	135.6	102.2	75.6	-	-	-
Helen M. Clements		-	-	-	-	-	-	-	-
Frank T. Heffelfinger		-	-	-	-	-	-	-	-
Cooperative Venture		-	-	-	-	-	-	-	-
Volunteer State		-	-	-	-	-	-	-	-
No name		-	-	-	-	-	-	-	-
Night 1		-	-	-	-	-	-	-	-
Night 2	7/20/91	-	-	-	-	-	-	-	-
Night 3		-	-	-	-	-	-	-	-
G.R. Packet		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-
Prosperity		-	-	-	-	-	-	-	-
Clyde Butcher		-	237.2	280.1	-	-	-	-	-
Lil Charley		-	148.3	173.1	-	-	-	-	-
C.W. Rushing		-	133.0	125.0	-	-	-	-	-
Conti-Nan		-	120.4	119.4	-	-	-	111.6	140.5
Mary L		-	-	-	-	-	-	-	-
Scarlet Knight	7/21/91	-	146.3	175.7	-	-	-	-	-
Conti-Karla		-	98.5	103.4	-	-	-	89.2	76.9

Goose Island Site, Trip 2

120 Minutes after Barge-Tow Passage (Concluded)

Tow name	Date	Suspended Sediment Concentration, mg/L							
		Station a1	*Station b1*	*Station b2*	*Station c1*	*Station c2*	*Station d1*	*Station e1*	*Station e2*
Cooperative Mariner	7/22/91	-	-	-	-	-	-	-	-
Hornet		-	105.9	130.6	-	-	-	-	-
Cooperative Ambassador		-	99.0	89.9	-	-	72.9	72.3	83.5
Eastern		-	96.2	86.4	-	-	70.7	74.0	85.0
Sam M. Fleming		-	94.2	84.0	-	-	68.4	80.3	85.0
Kevin Michael		-	118.8	104.0	-	-	72.5	74.7	78.3
A.M. Thompson	7/23/91	-	122.7	109.4	-	-	63.3	64.2	68.3
Susan Elizabeth		-	157.6	87.3	-	-	62.0	65.4	74.4
Lil Charley		-	157.6	87.3	-	-	62.0	65.4	74.4
Badger		-	-	-	-	-	-	-	-
Kay D		-	-	-	-	-	-	-	-
Evey-T		-	-		-	-	-	-	-
Robert Ingle		-	-	-	-	-	-	-	-
Prairie Dawn		-	-	-	-	-	-	-	-

APPENDIX XIX.

DATABASE ORGANIZATION FOR ALL STUDY SITES

DATABASE ORGANIZATION

The following eight databases were established for storing data from each site and trip:

Database name	*Database contents*	*No. of tables*
mcevers	McEver's Island data	21
applrivr	Apple River Island data	24
goose1	Goose Island, Trip 1 data	24
goose2	Goose Island, Trip 2 data	27
kamp1	Kampsville, Trip 1 data	25
kamp2	Kampsville, Trip 2 data	9
clarks1	Clarks Ferry, Trip 1 data	26
clarks2	Clarks Ferry, Trip 2 data	11

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McEver's Island Site

This section describes the 21 tables of the "mcevers" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1000,1001 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB527/642 and S4/071 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,999,1000,1001 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB527/642 and S4/071 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

bedprtcl : Contains the data for the bed material characteristics.

peakssc : Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30 minutes prior to barge-tow passage for this trip.

McEver's Island Site (Concluded)

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Apple River Island Site

This section describes the 24 tables of the "applrivr" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,1000,1001 and MMB527/332,642 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB511/999 and S4/071,040 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,1000,1001 and MMB527/332,642 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB511/999 and S4/071,040 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn :Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

windinfo : Contains the data for wind speed and direction.

tempinfo :Contains the data for water and air temperatures and stages for this trip.

recvesl : Contains the data for the recreational vessels characteristics.

bedprtcl : Contains the data for the bed material characteristics.

peakssc : Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

Apple River Island Site (Concluded)

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Goose Island Site, Trip 1

This section describes the 24 tables of the "goose1" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1000,1001 and MMB527/642 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB527/332 and S4/071,040 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,999,1000,1001 and MMB527/642 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB527/332 and S4/071,040 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

windinfo : Contains the data for wind speed and direction.

tempinfo : Contains the data for water and air temperatures and stages for this trip.

recvesl : Contains the data for the recreational vessels characteristics.

bedprtcl : Contains the data for the bed material characteristics.

peakssc : Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

Goose Island Site, Trip 1 (Concluded)

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Goose Island Site, Trip 2

This section describes the 27 tables of the "goose2" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1001,1130,1131 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB511/1000,MMB527/332,642 and S4/071,151 meters before barge-tow passage.

ambvel3 : Contains the data for the mean ambient velocity from S4/040,832,834 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,999,1001,1130,1131 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB511/1000, MMB527/332,642 and S4/071,151 meters during barge-tow passage.

impvel3 : Contains the data for the impact velocity from S4/040,832,834 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

windinfo : Contains the data for wind speed and direction.

tempinfo :Contains the data for water and air temperatures and stages for this trip.

recvesl : Contains the data for the recreational vessels characteristics.

bedprtcl : Contains the data for the bed material characteristics.

Goose Island Site, Trip 2 (Concluded)

ambssc : Contains the data for ambient suspended sediment concentrations.

peakssc : Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Kampsville Site, Trip 1

This section describes the 25 tables of the "kamp1" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1000,1001 and MMB527/642 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB527/332 and S4/040,071 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,999,1000,1001 and MMB527/642 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB527/332 and S4/040,071 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

windinfo : Contains the data for wind speed and direction.

tempinfo : Contains the data for water and air temperatures and stages for this trip.

recvesl : Contains the data for the recreational vessels characteristics.

bedprtcl : Contains the data for the bed material characteristics.

ambssc : Contains the data for ambient suspended sediment concentrations.

peakssc :Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

Kampsville Site, Trip 1 (Concluded)

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Kampsville Site, Trip 2

This section describes the 9 tables of the "kamp2" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1001 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MMB511/1000 and MMB527/332,642 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/998,999,1001 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB511/1000 and MMB527/332,642 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

tempinfo : Contains the data for water and air temperatures and stages for this trip.

ambssc : Contains the data for ambient suspended sediment concentrations

Clarks Ferry Site, Trip 1

This section describes the 26 tables of the "clarks1" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/1001,1130,1131,998,999 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MB511/1000,MMB527/332,642 and S4/151,834 meters before barge-tow passage.

ambvel3 : Contains the data for the mean ambient velocity from S4/040,832,071 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from MMB511/1001,1130,1131,998,999 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB511/1000, MMB527/332,642 and S4/151,834 meters during barge-tow passage.

impvel3 : Contains the data for the impact velocity from S4/040,832,071 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

watrslpe : Contains the data for the water surface slopes.

windinfo : Contains the data for wind speed and direction.

tempinfo : Contains the data for water and air temperatures and stages for this trip.

recvesl : Contains the data for the recreational vessels characteristics.

ambssc : Contains the data for ambient suspended sediment concentrations.

Clarks Ferry Site, Trip 1 (Concluded)

peakssc : Contains the data for the peak suspended sediment concentrations for the events for this trip.

avssc : Contains the data for the average suspended sediment concentrations during the events for this trip.

ssc2bef : Contains the data for the suspended sediment concentrations 2 minutes prior to barge-tow passage for this trip.

ssc5bef : Contains the data for the suspended sediment concentrations 5 minutes prior to barge-tow passage for this trip.

ssc10bef : Contains the data for the suspended sediment concentrations 10 minutes prior to barge-tow passage for this trip.

ssc30bef : Contains the data for the suspended sediment concentrations 30minutes prior to barge-tow passage for this trip.

ssc60bef : Contains the data for the suspended sediment concentrations 60 minutes prior to barge-tow passage for this trip.

ssc2af : Contains the data for the suspended sediment concentrations 2 minutes after barge-tow passage for this trip.

ssc5af : Contains the data for the suspended sediment concentrations 5 minutes after barge-tow passage for this trip.

ssc30af : Contains the data for the suspended sediment concentrations 30 minutes after barge-tow passage for this trip.

ssc60af : Contains the data for the suspended sediment concentrations 60 minutes after barge-tow passage for this trip.

ssc90af : Contains the data for the suspended sediment concentrations 90 minutes after barge-tow passage for this trip.

ssc120af : Contains the data for the suspended sediment concentrations 120 minutes after barge-tow passage for this trip.

Clarks Ferry Site, Trip 2

This section describes the 11 tables of the "clarks2" database.

ambvel1 : Contains the data for the mean ambient velocity from MMB511/998,999,1000,1001,1130 meters before barge-tow passage.

ambvel2 : Contains the data for the mean ambient velocity from MB511/1131,MMB527/332,642 and S4/834 meters before barge-tow passage.

ambvel3 : Contains the data for the mean ambient velocity from S4/151,832,040 meters before barge-tow passage.

impvel1 : Contains the data for the impact velocity from 511/998,999,1000,1001,1130 meters during barge-tow passage.

impvel2 : Contains the data for the impact velocity from MMB511/1131, MMB527/332,642 and S4/834 meters during barge-tow passage.

impvel3 : Contains the data for the impact velocity from S4/151,832,040 meters during barge-tow passage.

brgeinfo : Contains the data for the traffic characteristics.

wvhtdrdn : Contains the data for the maximum waveheight and maximum drawdown.

tempinfo : Contains the data for water and air temperatures and stages for this trip

recvesl : Contains the data for the recreational vessels characteristics.

bedprtcl : Contains the data for the bed material characteristics.

APPENDIX XX.

SAMPLE PLOTS OF ALTERED VELOCITY REGIMES DUE TO MOVEMENT OF NAVIGATION TRAFFIC

XX-1. Velocity fluctuations measured by two-dimensional current meters for barge *Reliance*, McEver's Island

Preceding Page Blank

Reliance (5/18/89)

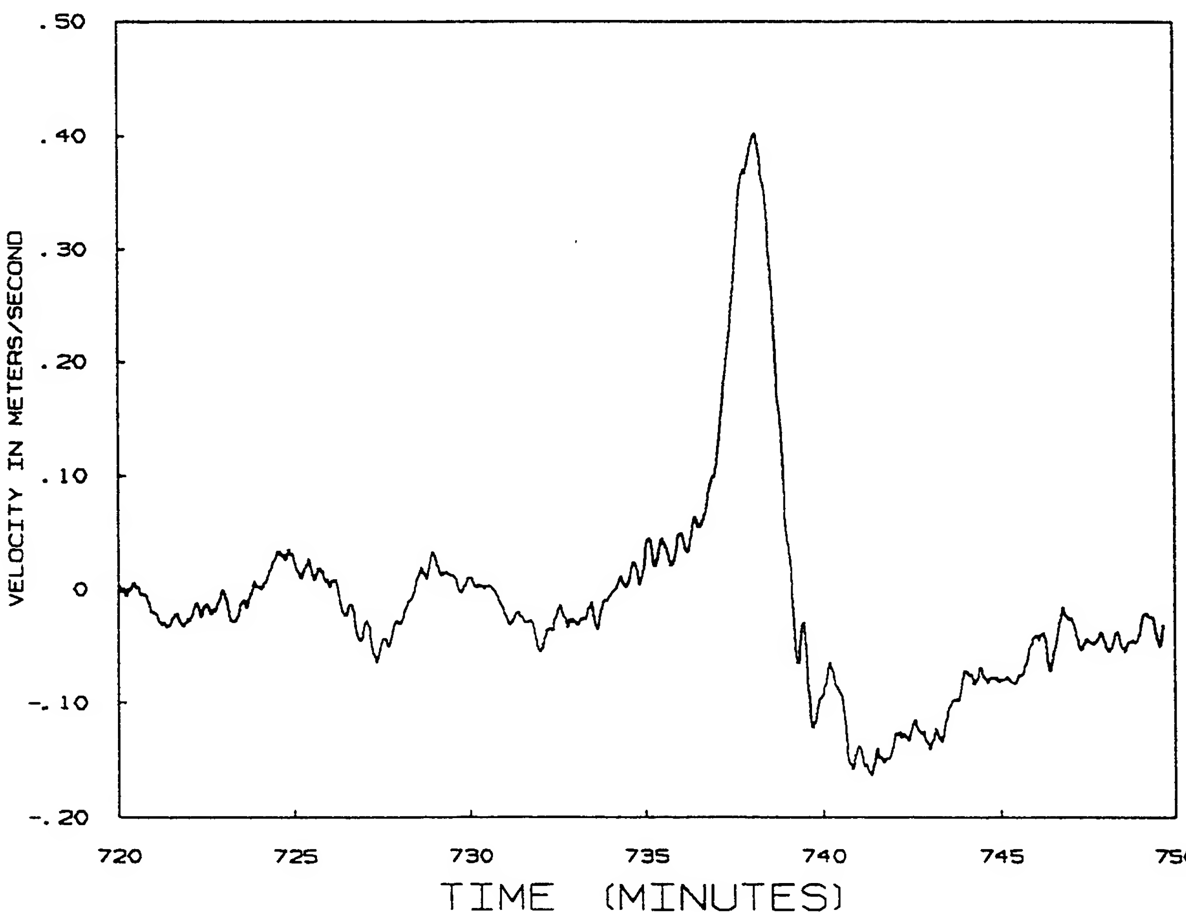
Status of Electromagnetic Current Meters:

998 (MMB511)	999 (MMB511)	1000 (MMB511)	1001 (MMB511)
√	√	√	*
642 (MMB527)			
√			
071 (S4)			
√			

Note: √ : Working
* : Not working
- : Unavailable

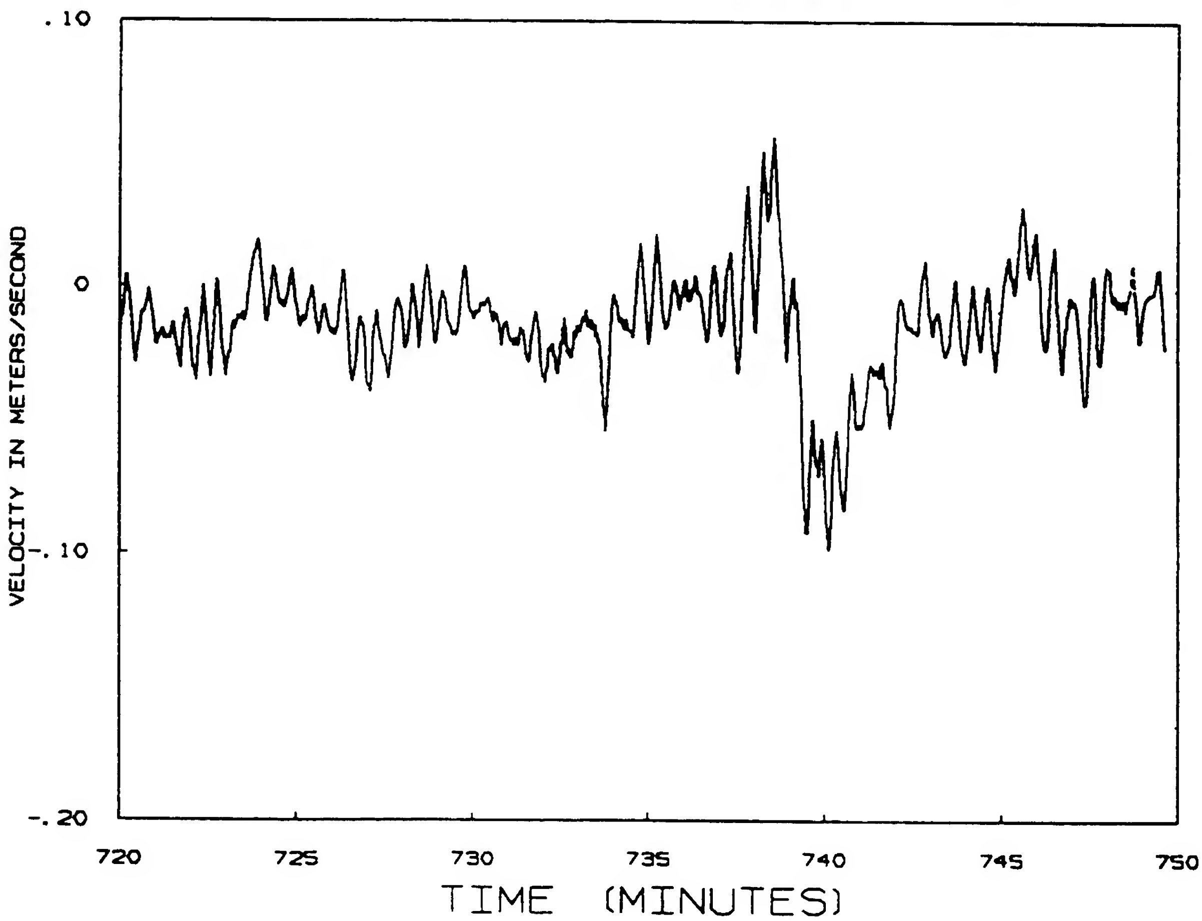
meter number	511- 998	start-time	1200
tow name	reliance	end-time	1230
configuration	3x5	mean = -0.01	
draft	6.8	vmax = 0.00	tmax = 738.
speed	5.1 mph	vmin = 0.00	tmin = 741.
direction	upstream		
distance	623		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



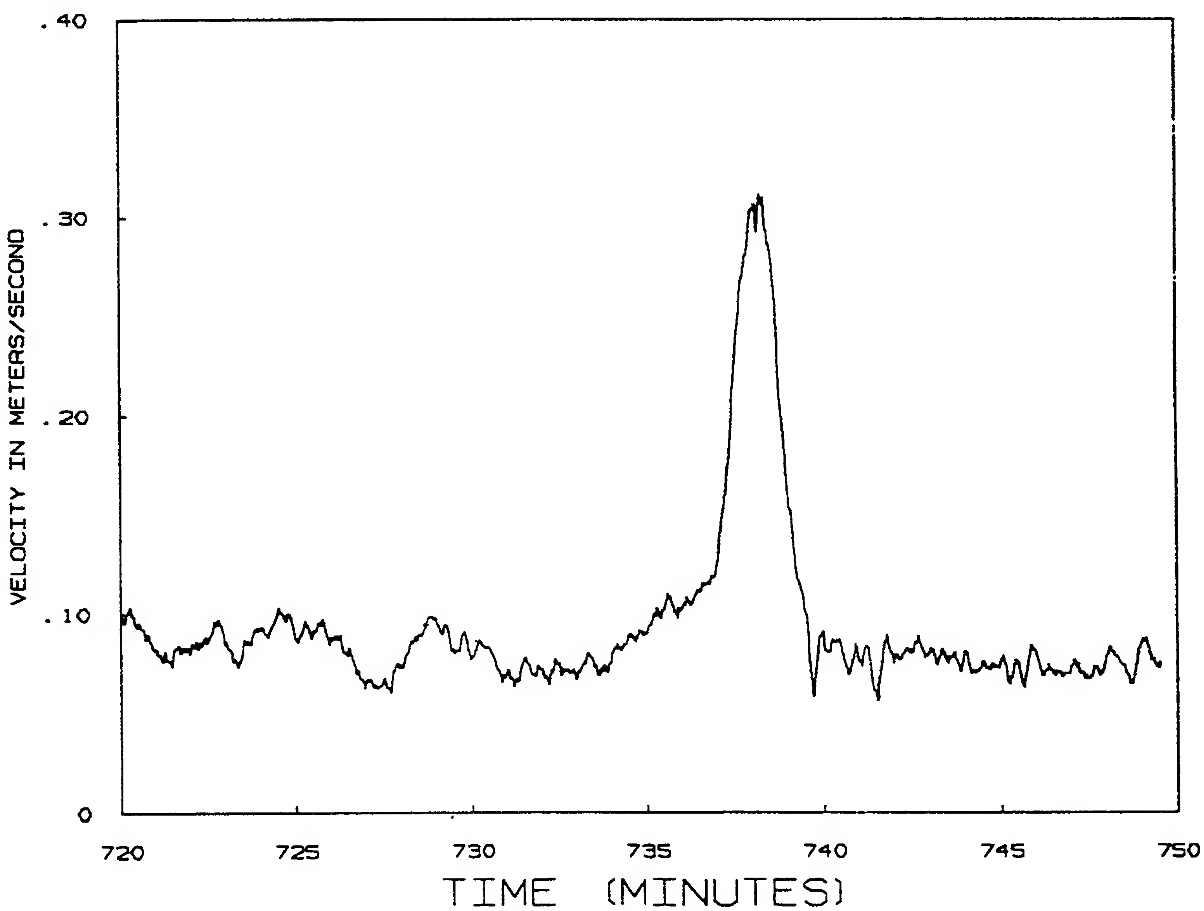
meter number	511- 998	start-time	1200
tow name	reliance	end-time	1230
configuration	3x5	mean = −0.01	
draft	6.8	vmax = 0.00	tmax = 739.
speed	5.1 mph	vmin = 0.00	tmin = 740.
direction	upstream		
distance	623		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT

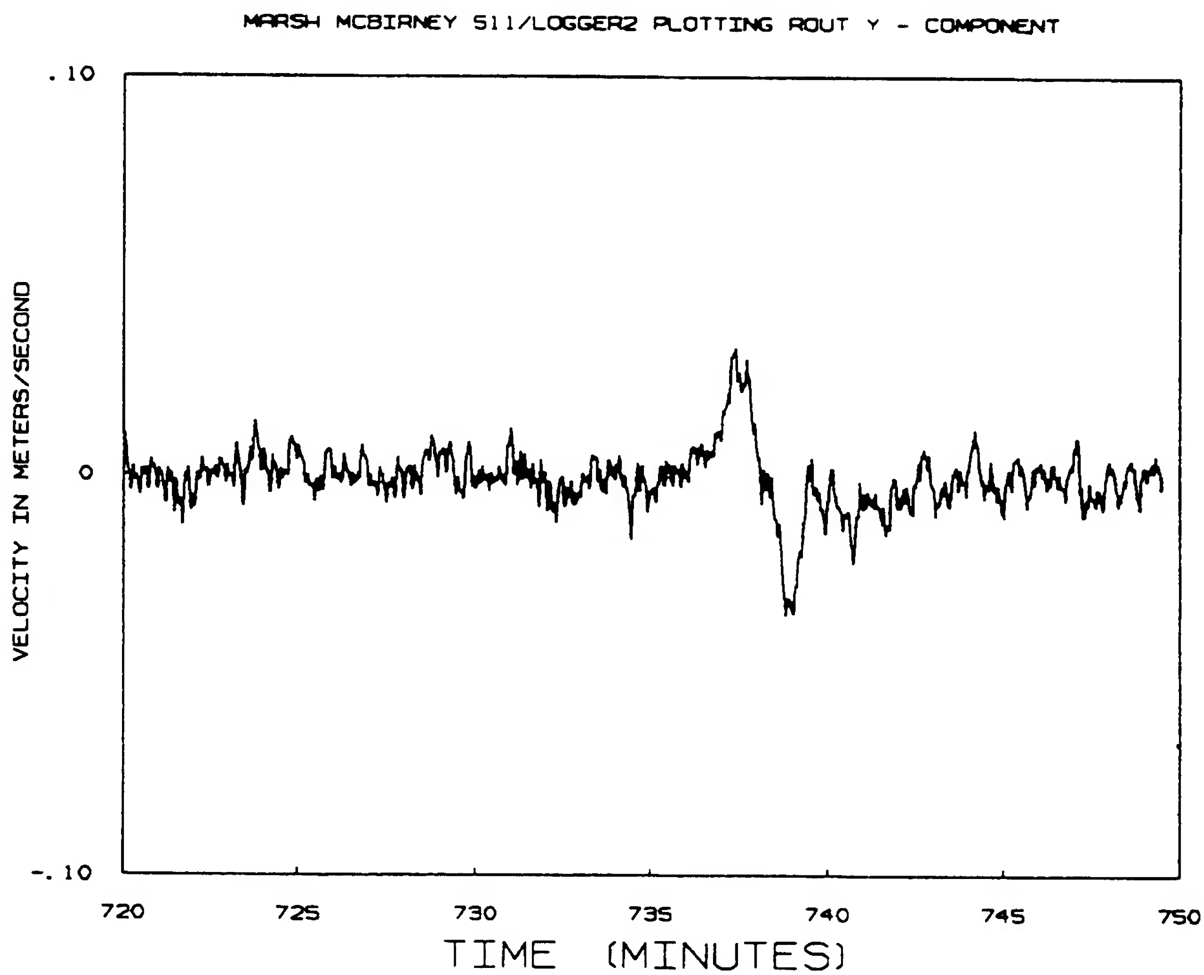


meter number	999	distance	623
tow name	reliance	start–time	1200
configuration	3x5	end–time	1230
draft	6.8	mean =	0.09
speed	5.1 mph	vmax =	0.31 tmax = 738.
direction	upstream	vmin =	0.06 tmin = 742.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

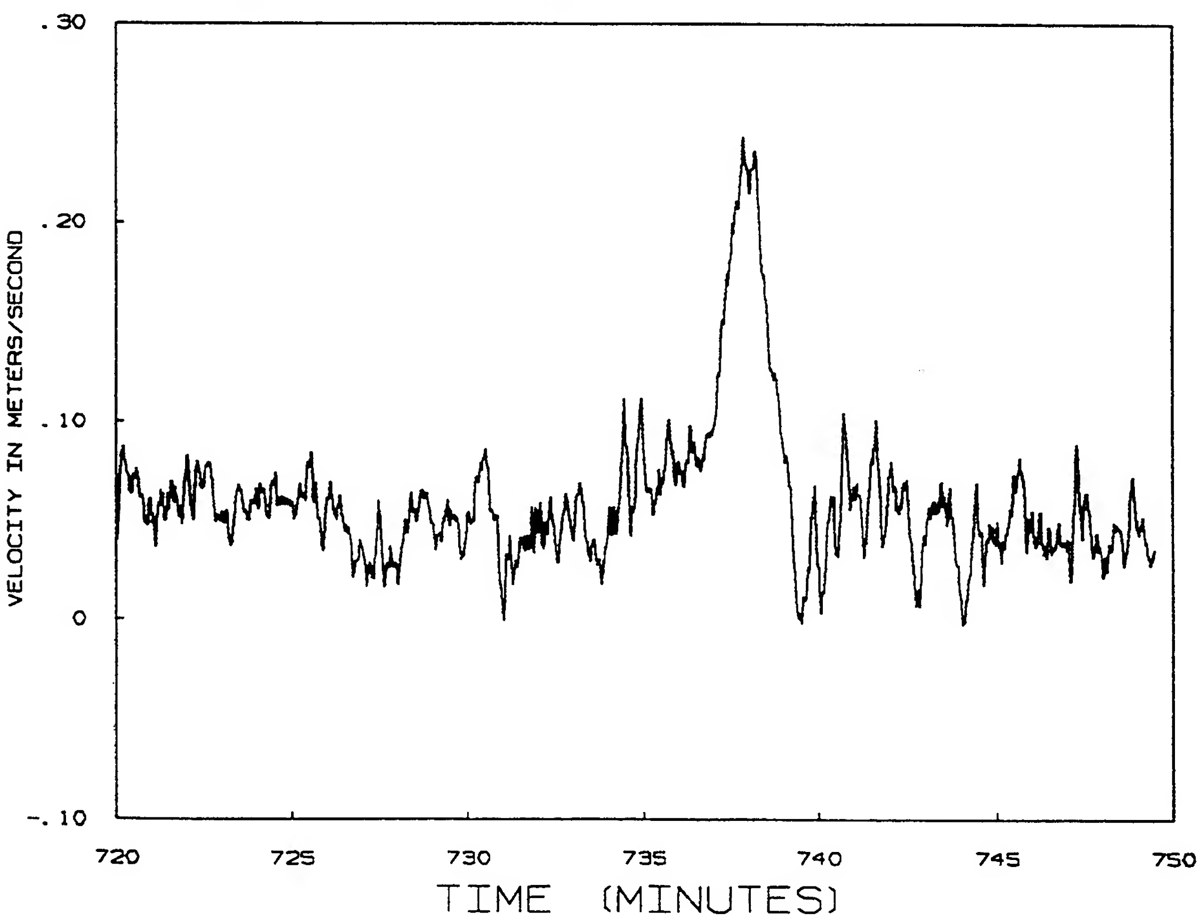


meter number	999	distance	623
tow name	reliance	start-time	1200
configuration	3x5	end-time	1230
draft	6.8	mean = 0.00	
speed	5.1 mph	vmax = 0.03	tmax = 737.
direction	upstream	vmin = −0.03	tmin = 739.

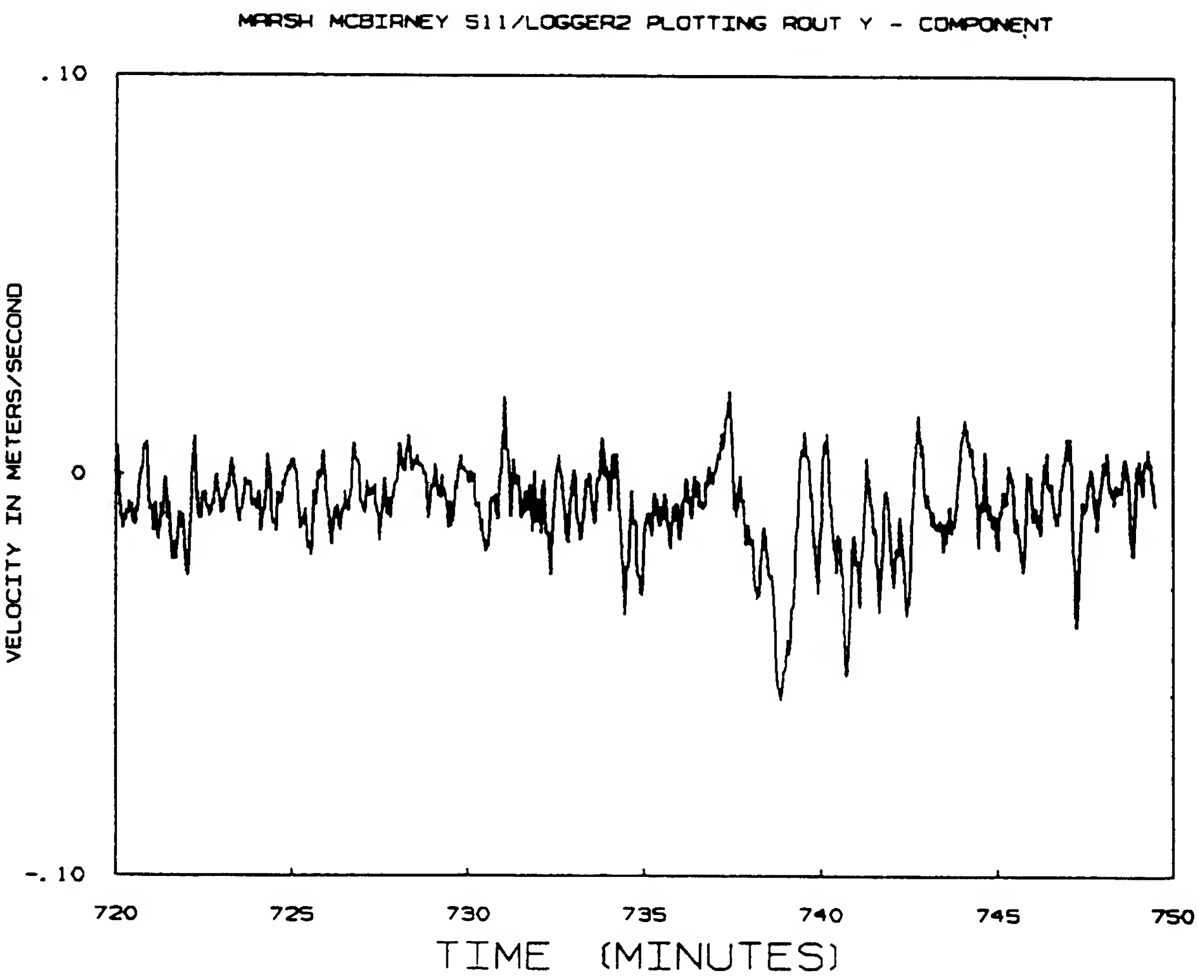


meter number	1000	distance	623
tow name	reliance	start-time	1200
configuration	3x5	end-time	1230
draft	6.8	mean =	0.05
speed	5.1 mph	vmax =	0.24 tmax = 738.
direction	upstream	vmin =	0.00 tmin = 744.

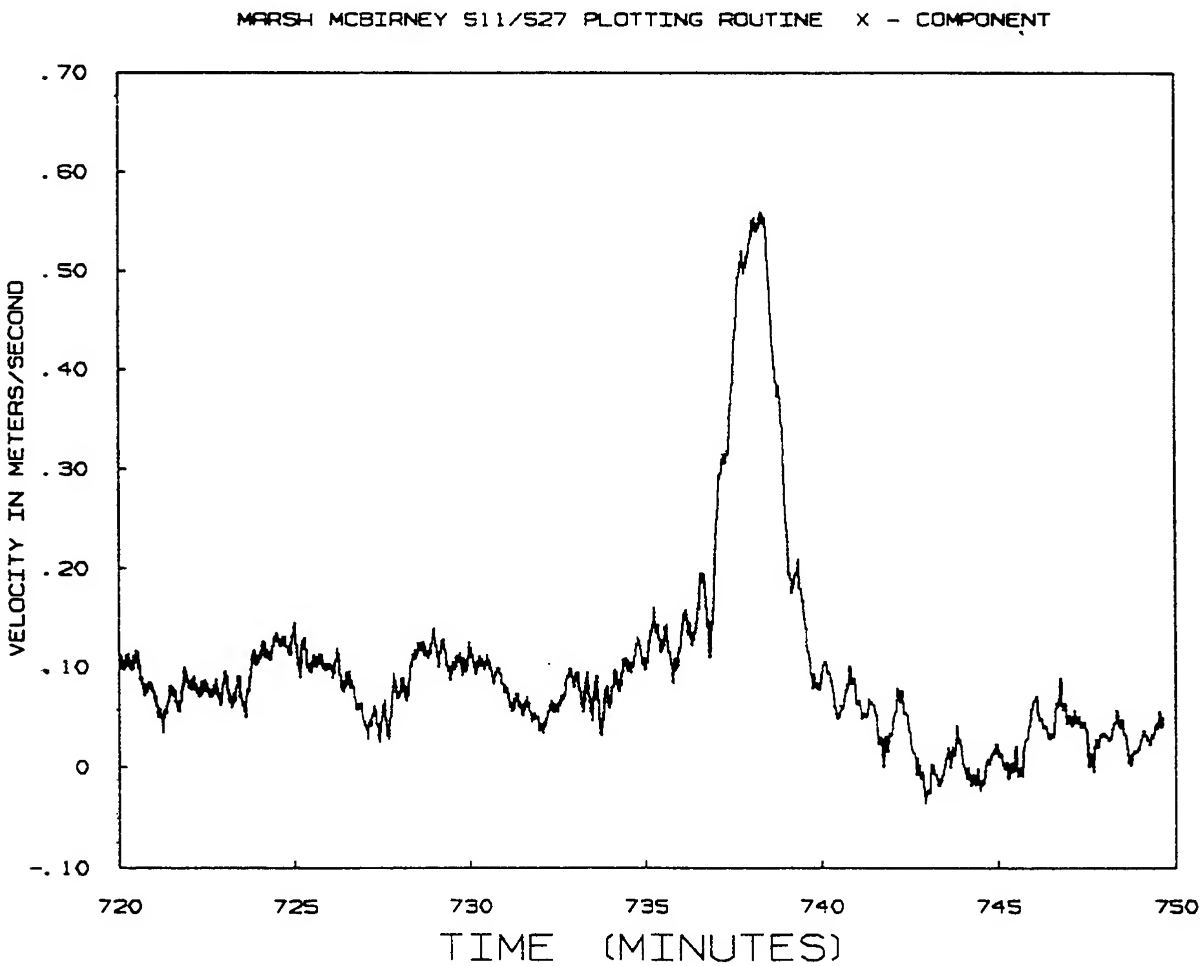
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



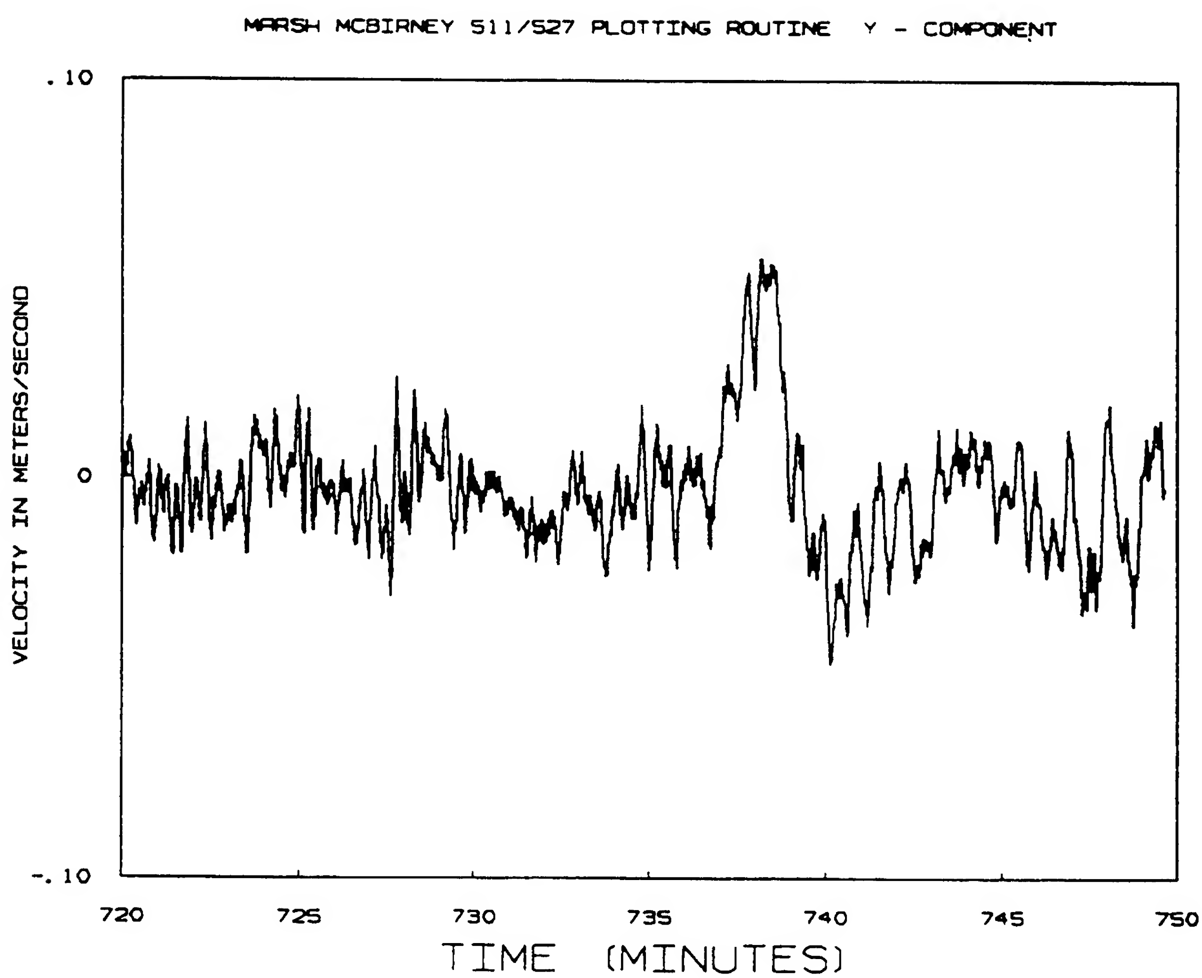
meter number	1000	distance			623			
tow name	reliance	start-time			1200			
configuration	3x5	end-time			1230			
draft	6.8	mean	=	-0.01				
speed	5.1 mph	vmax	=	0.02	tmax	=	737.	
direction	upstream	vmin	=	-0.06	tmin	=	739.	



meter number	B-642	start-time	1200
tow name	reliance	end-time	1230
configuration	3x5	mean = 0.09	
draft	6.8	vmax = 0.00	tmax = 738.
speed	5.1 mph	vmin = 0.00	tmin = 743.
direction	upstream		
distance	623		

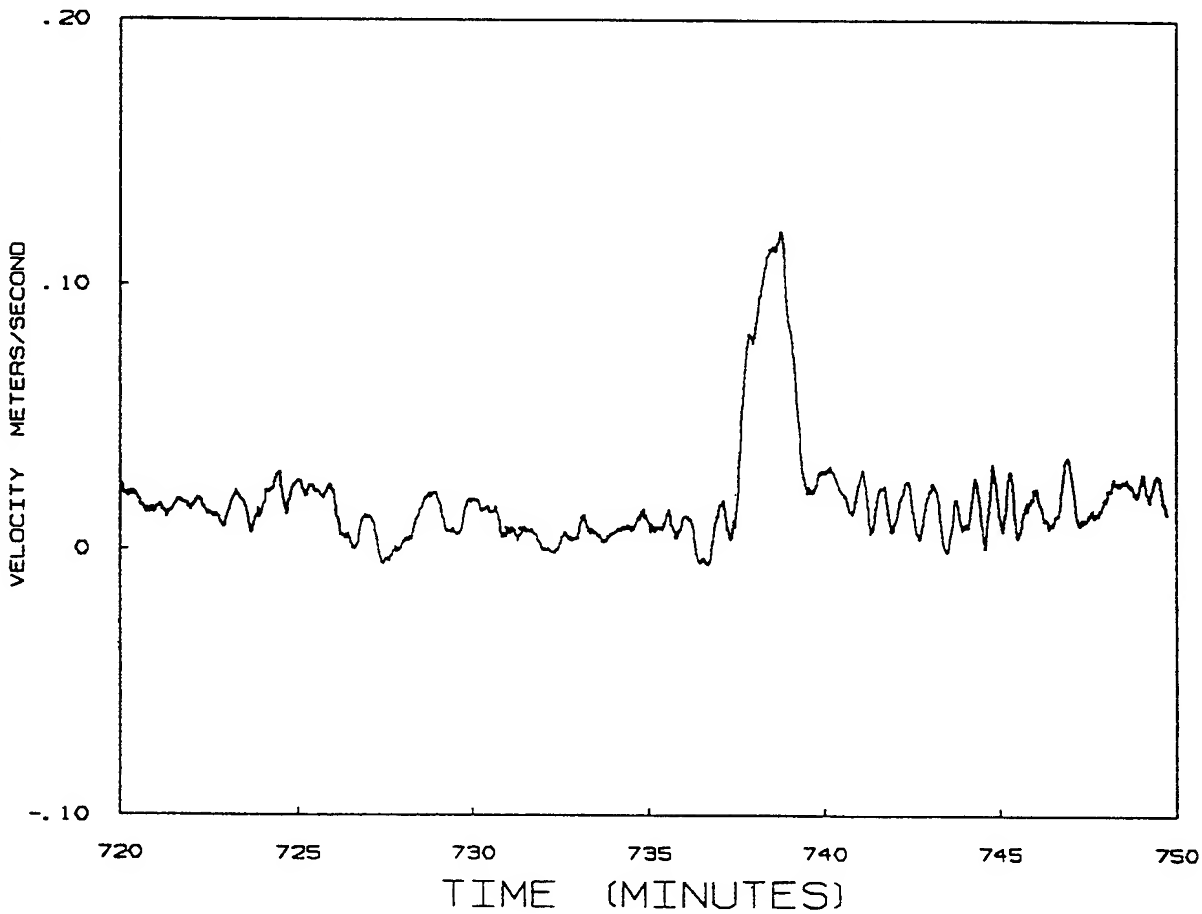


meter number	B-642	start-time	1200
tow name	reliance	end-time	1230
configuration	3x5	mean =	0.00
draft	6.8	vmax =	0.00 tmax = 738.
speed	5.1 mph	vmin =	0.00 tmin = 740.
direction	upstream		
distance	623		

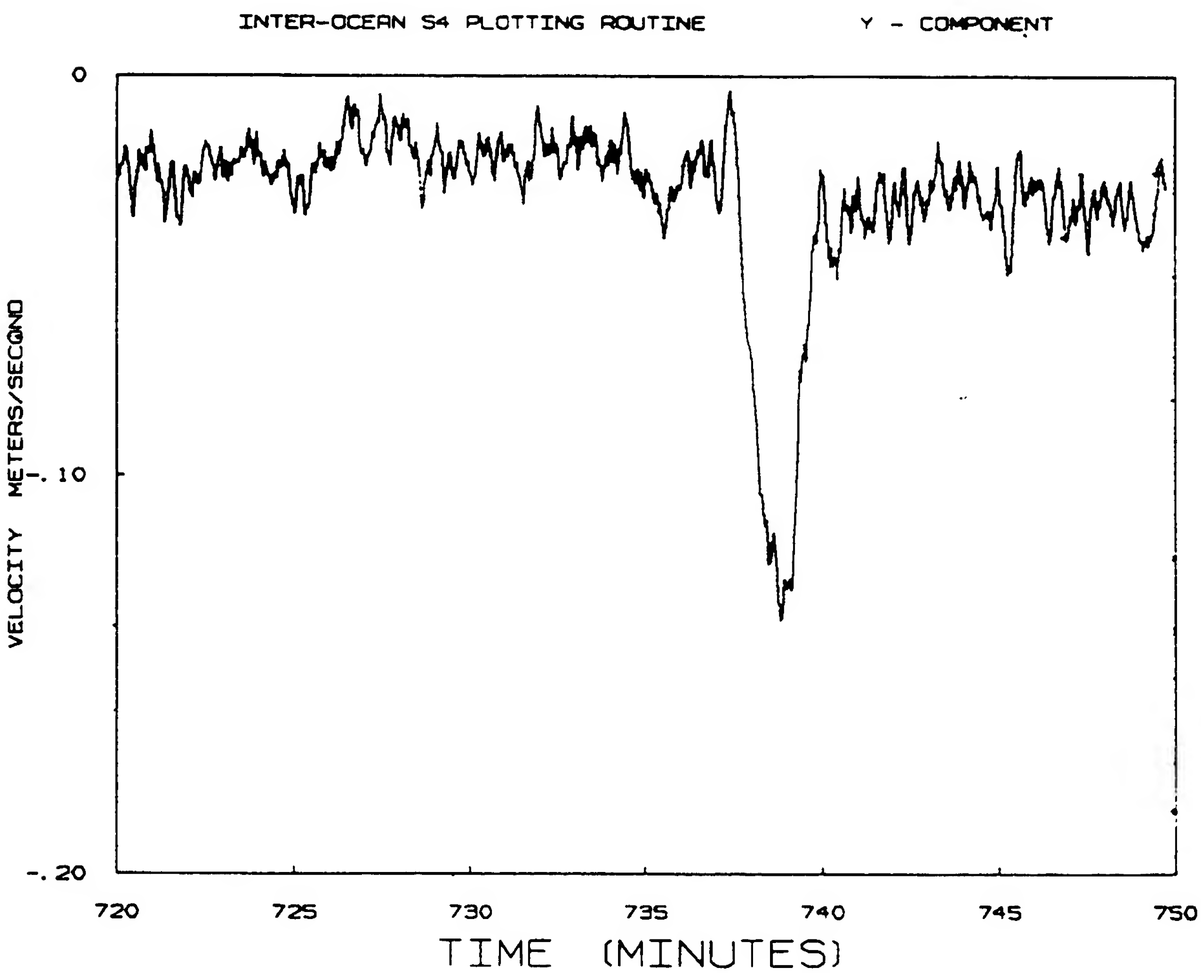


meter number	071	distance		623			
tow name	reliance	start-time		1200			
configuration	3x5	end-time		1230			
draft	6.8	MEAN	=	0.01			
speed	5.1 mph	VMAX	=	0.12	TMAX	=	739.
direction	upstream	VMIN	=	-0.01	TMIN	=	737.

INTER-OCEAN S4 PLOTTING ROUTINE X - COMPONENT



meter number	071	distance	623		
tow name	reliance	start-time	1200		
configuration	3x5	end-time	1230		
draft	6.8	MEAN =	-0.02		
speed	5.1 mph	VMAX =	0.00	TMAX =	737.
direction	upstream	VMIN =	-0.14	TMIN =	739.



XX-2. Velocity fluctuations measured by two-dimensional current meters for barge *D. Ray Miller,* Apple River Island

D. Ray Miller (5/21/90)

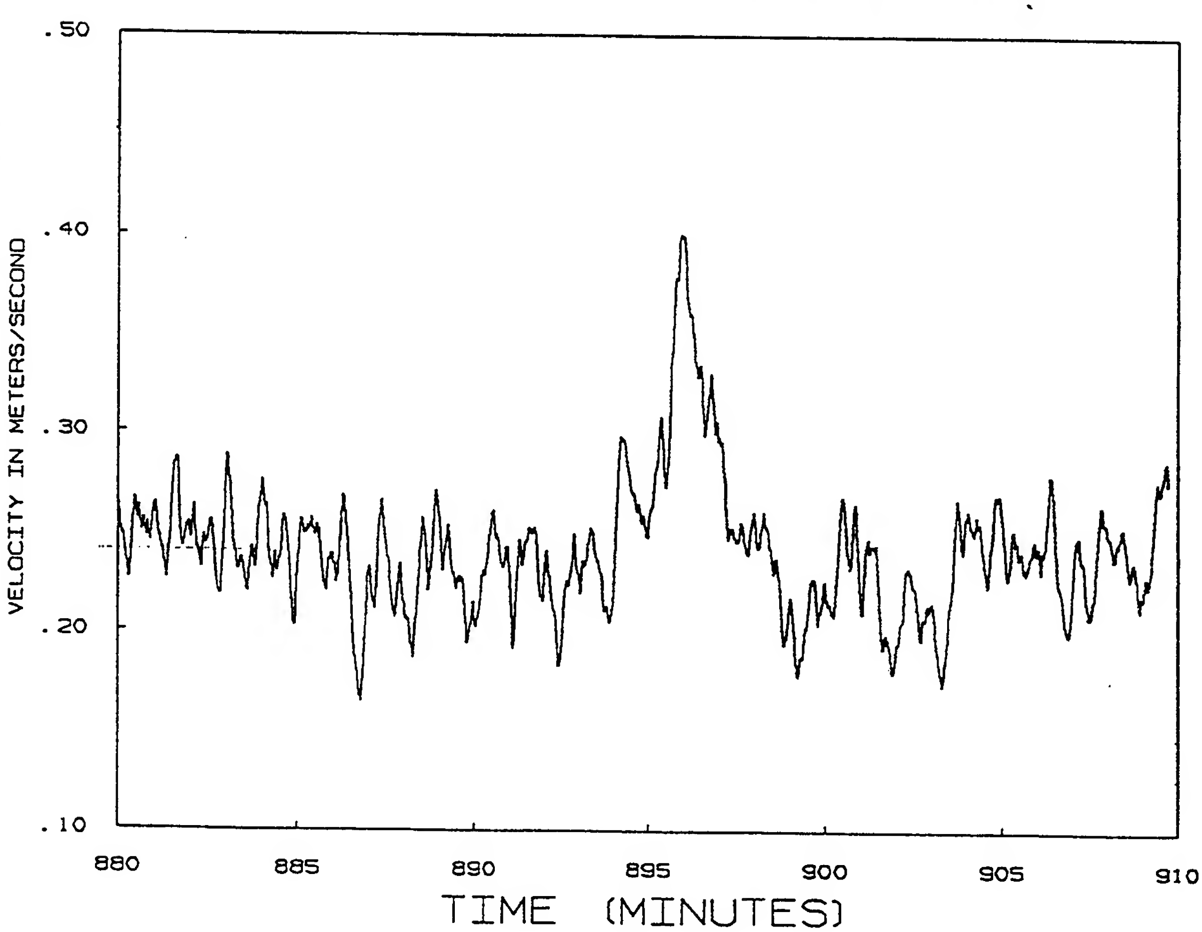
Status of Electromagnetic Current Meters:

1001 (MMB511) √	1000 (MMB511) √	998 (MMB511) √	999 (MMB511) *
642 (MMB527) √	332 (MMB527) √		
071 (S4) √	040 (S4) √		

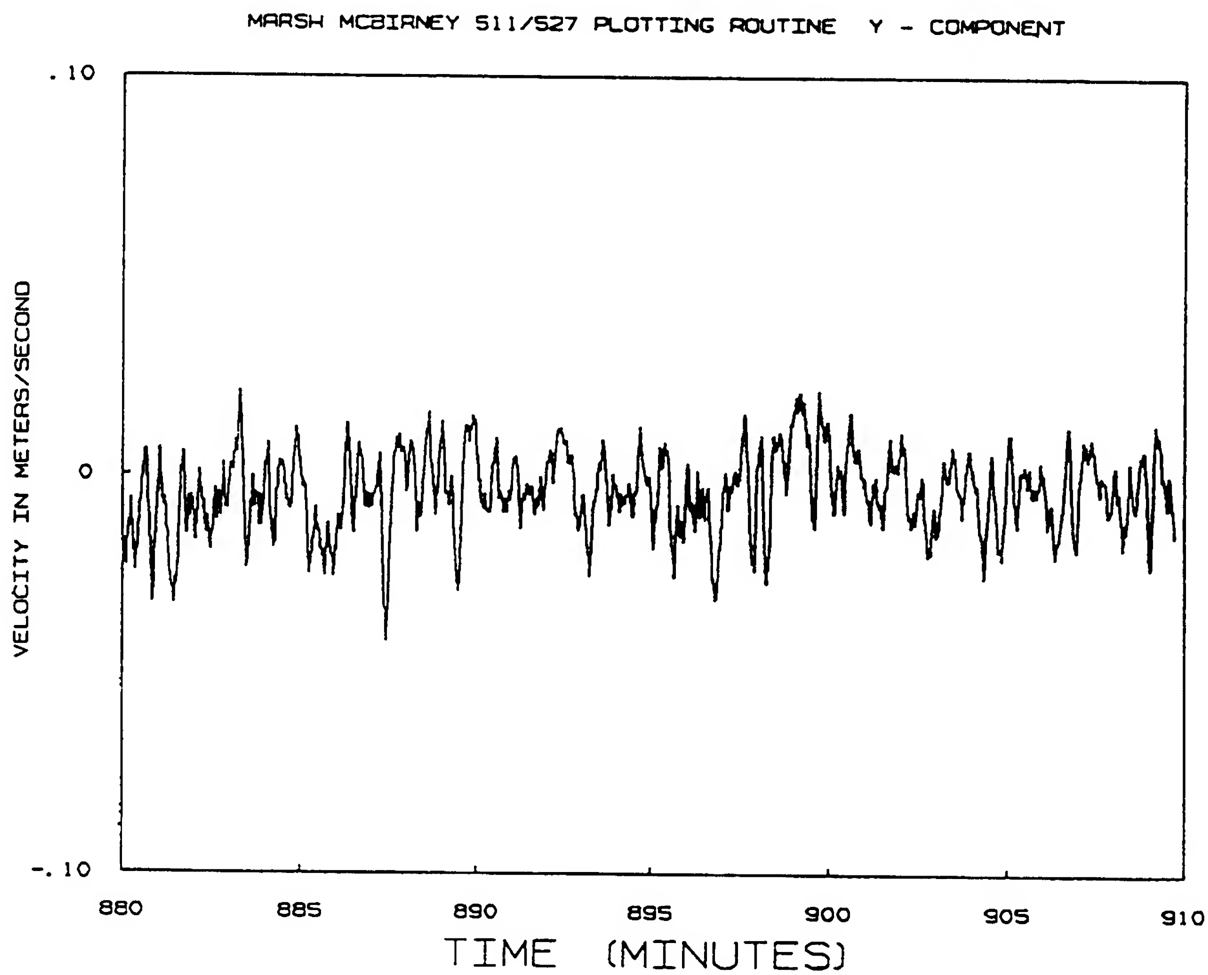
Note: √ : Working
* : Not working
- : Unavailable

meter number	511-1001	start-time	1440
tow name	d.ray miller	end-time	1510
configuration	3x3+2x1	mean =	0.24
draft	7.1	vmax = 0.00	tmax = 896.
speed	4.9 mph	vmin = 0.00	tmin = 887.
direction	upstream		
distance	700		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

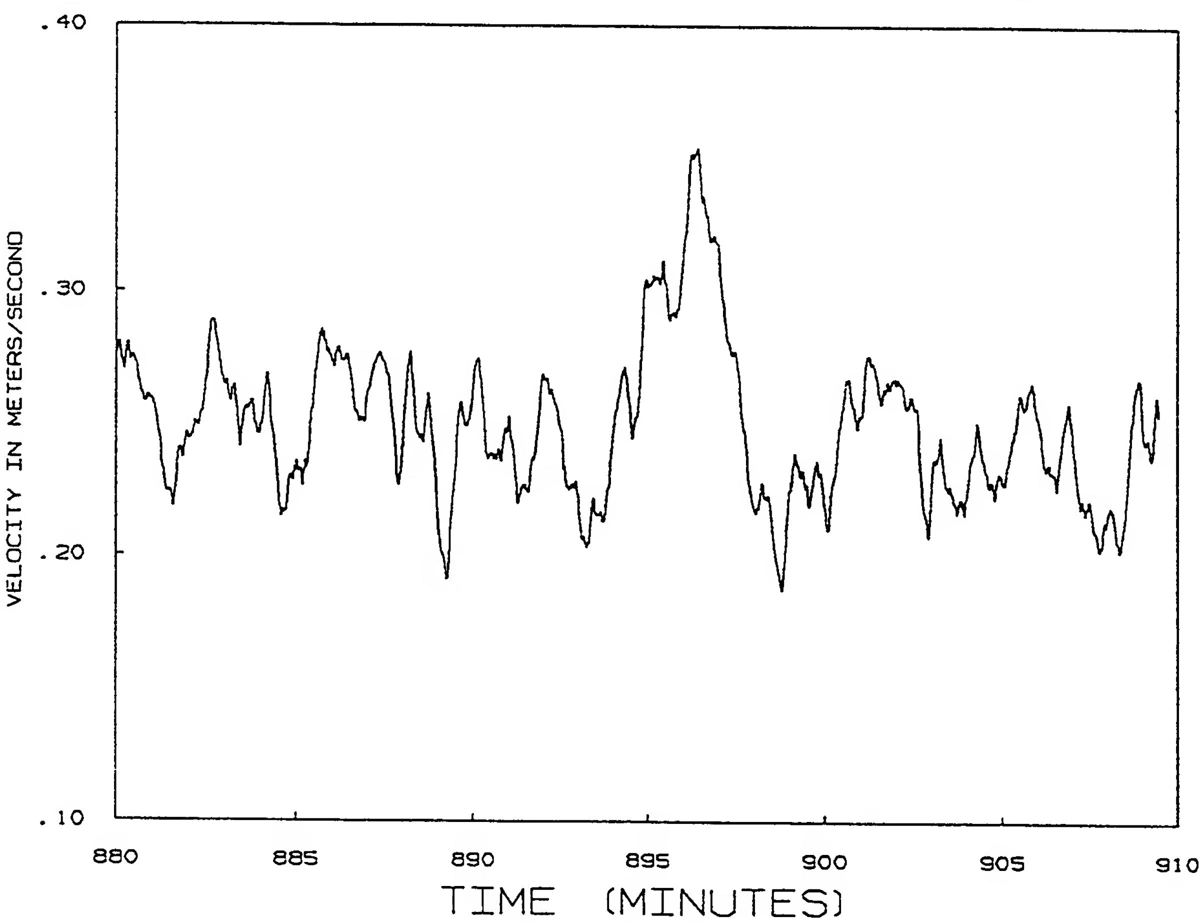


meter number	511−1001	start−time	1440
tow name	d.ray miller	end−time	1510
configuration	3x3+2x1	mean = −0.01	
draft	7.1	vmax = 0.00	tmax = 900.
speed	4.9 mph	vmin = 0.00	tmin = 887.
direction	upstream		
distance	700		



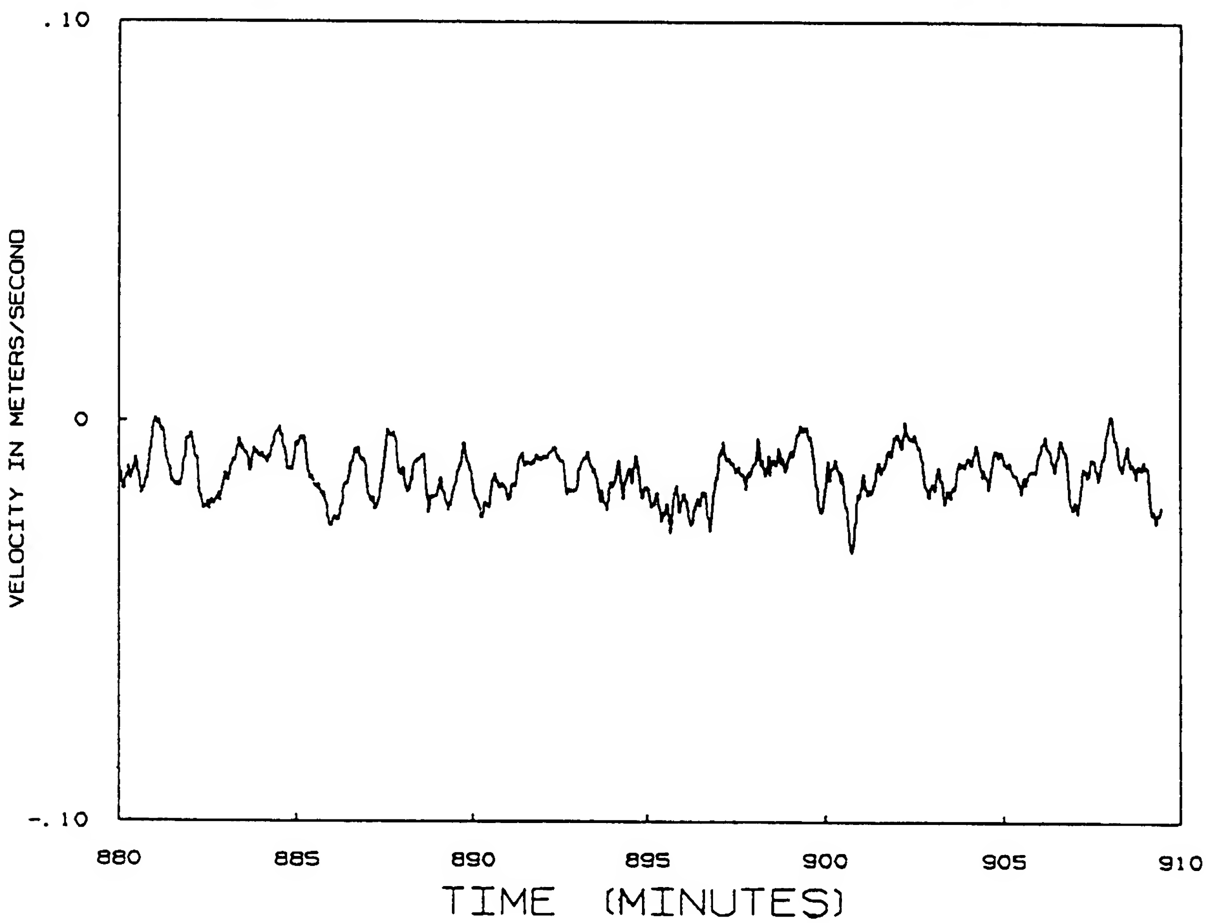
meter number	1000	distance	700
tow name	d.ray miller	start-time	1440
configuration	3x3+2x1	end-time	1510
draft	7.1	mean =	0.25
speed	4.9 mph	vmax =	0.35 tmax = 896.
direction	upstream	vmin =	0.19 tmin = 899.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



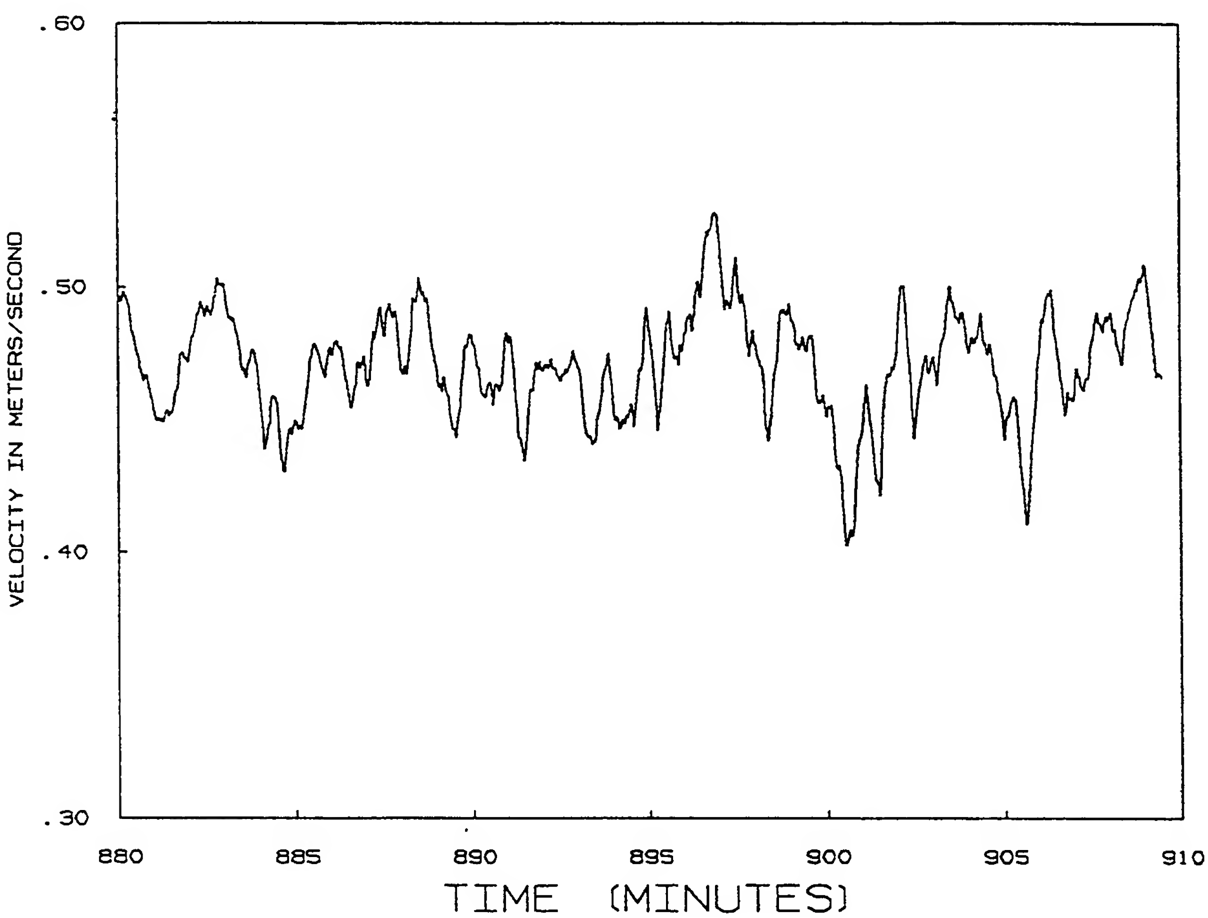
meter number	1000	distance	700
tow name	d.ray miller	start-time	1440
configuration	3x3+2x1	end-time	1510
draft	7.1	mean = -0.01	
speed	4.9 mph	vmax = 0.00	tmax = 908.
direction	upstream	vmin = -0.03	tmin = 901.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



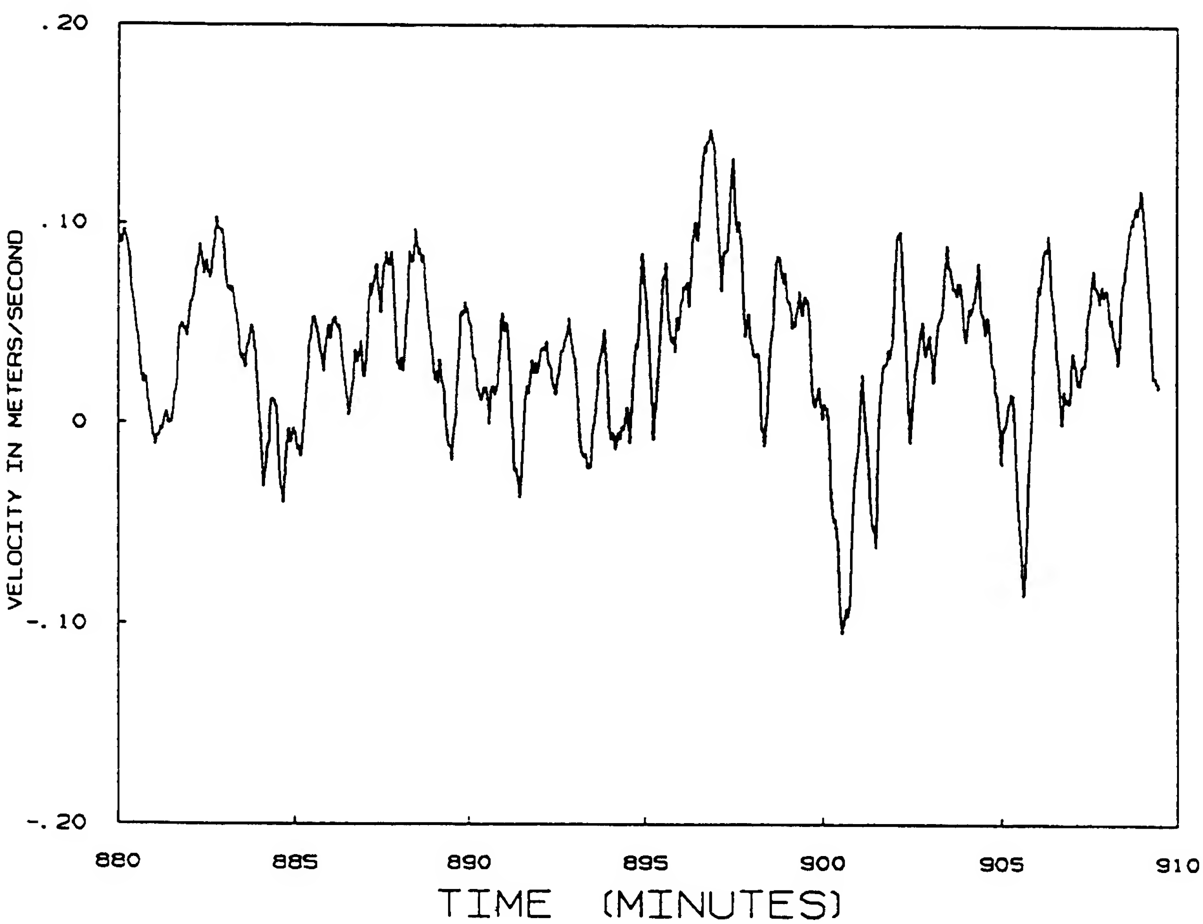
meter number	998	distance	700
tow name	d.ray miller	start-time	1440
configuration	3x3+2x1	end-time	1510
draft	7.1	mean =	0.47
speed	4.9 mph	vmax =	0.53 tmax = 897.
direction	upstream	vmin =	0.40 tmin = 901.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



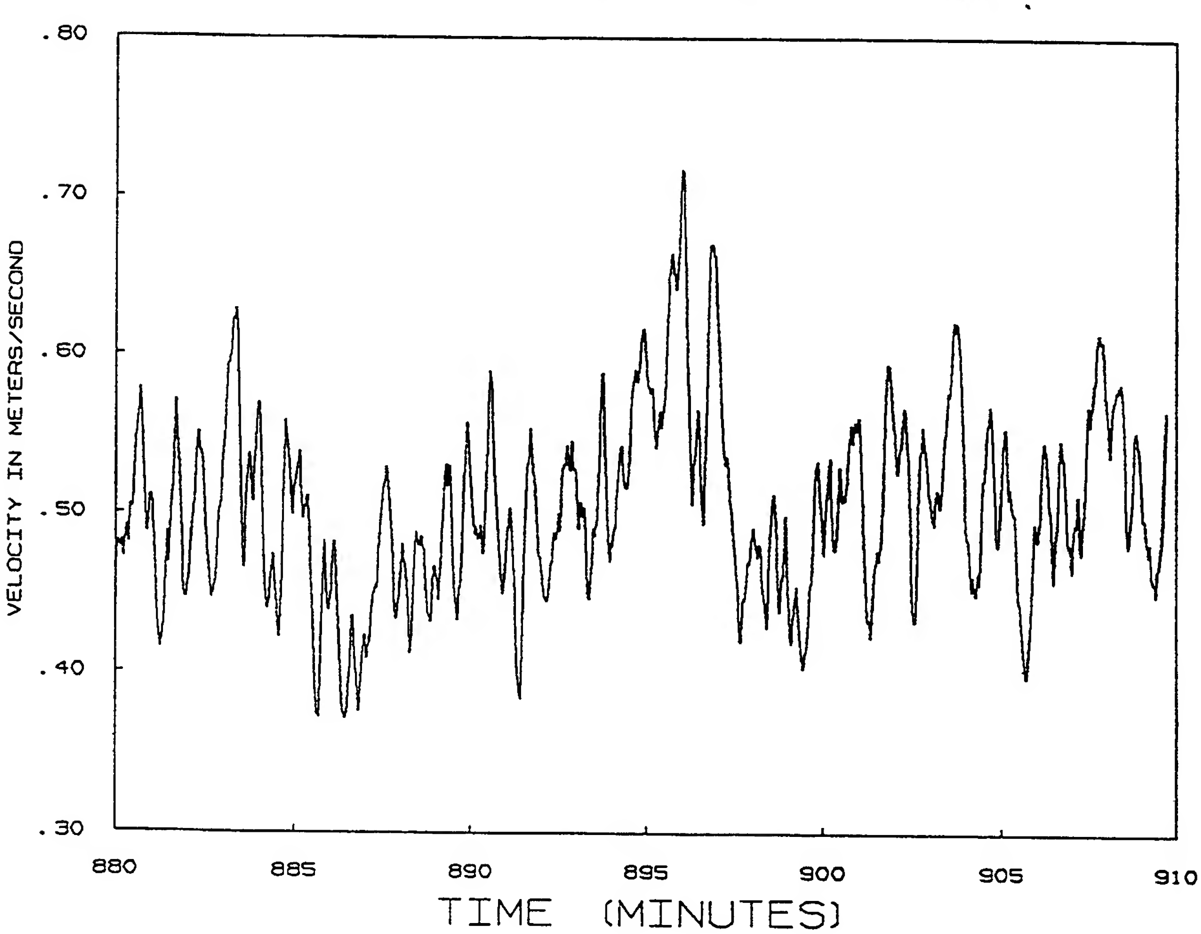
meter number	998	distance	700
tow name	d.ray miller	start-time	1440
configuration	3x3+2x1	end-time	1510
draft	7.1	mean =	0.04
speed	4.9 mph	vmax =	0.15 tmax = 897.
direction	upstream	vmin =	-0.10 tmin = 901.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

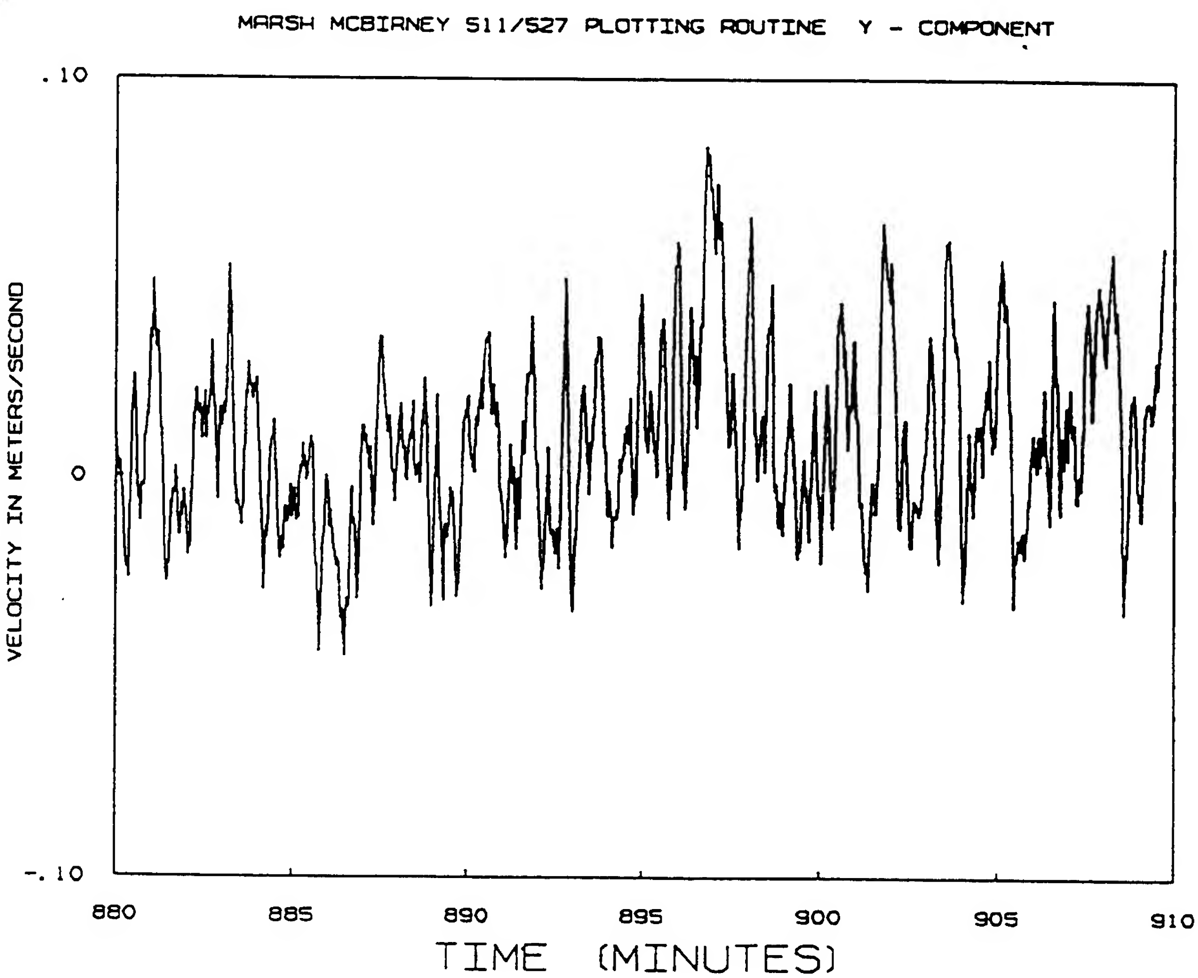


meter number	B-642	start-time	1440
tow name	d.ray miller	end-time	1510
configuration	3x3+2x1	mean =	0.48
draft	7.1	vmax =	0.00 tmax = 896.
speed	4.9 mph	vmin =	0.00 tmin = 886.
direction	upstream		
distance	700		

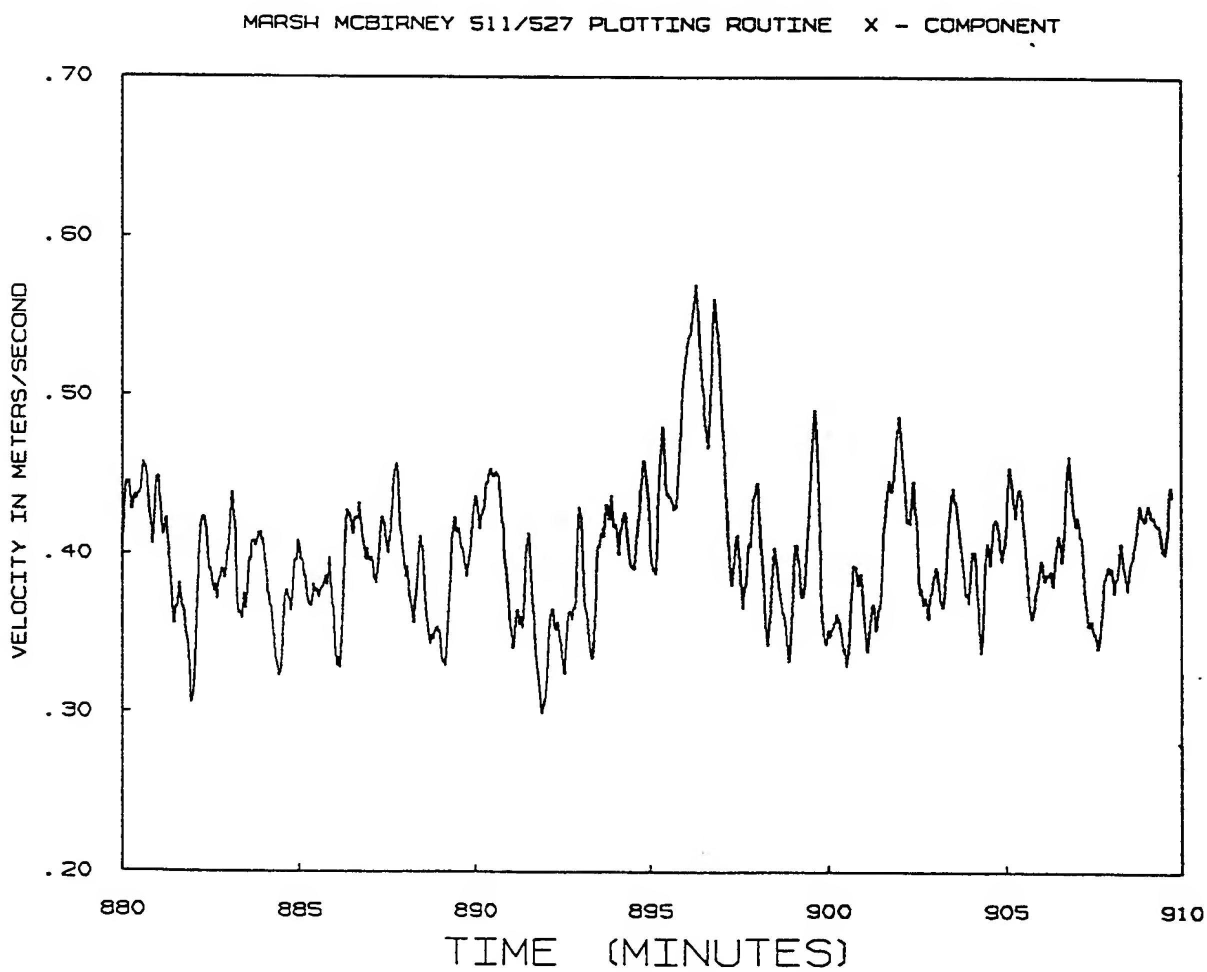
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



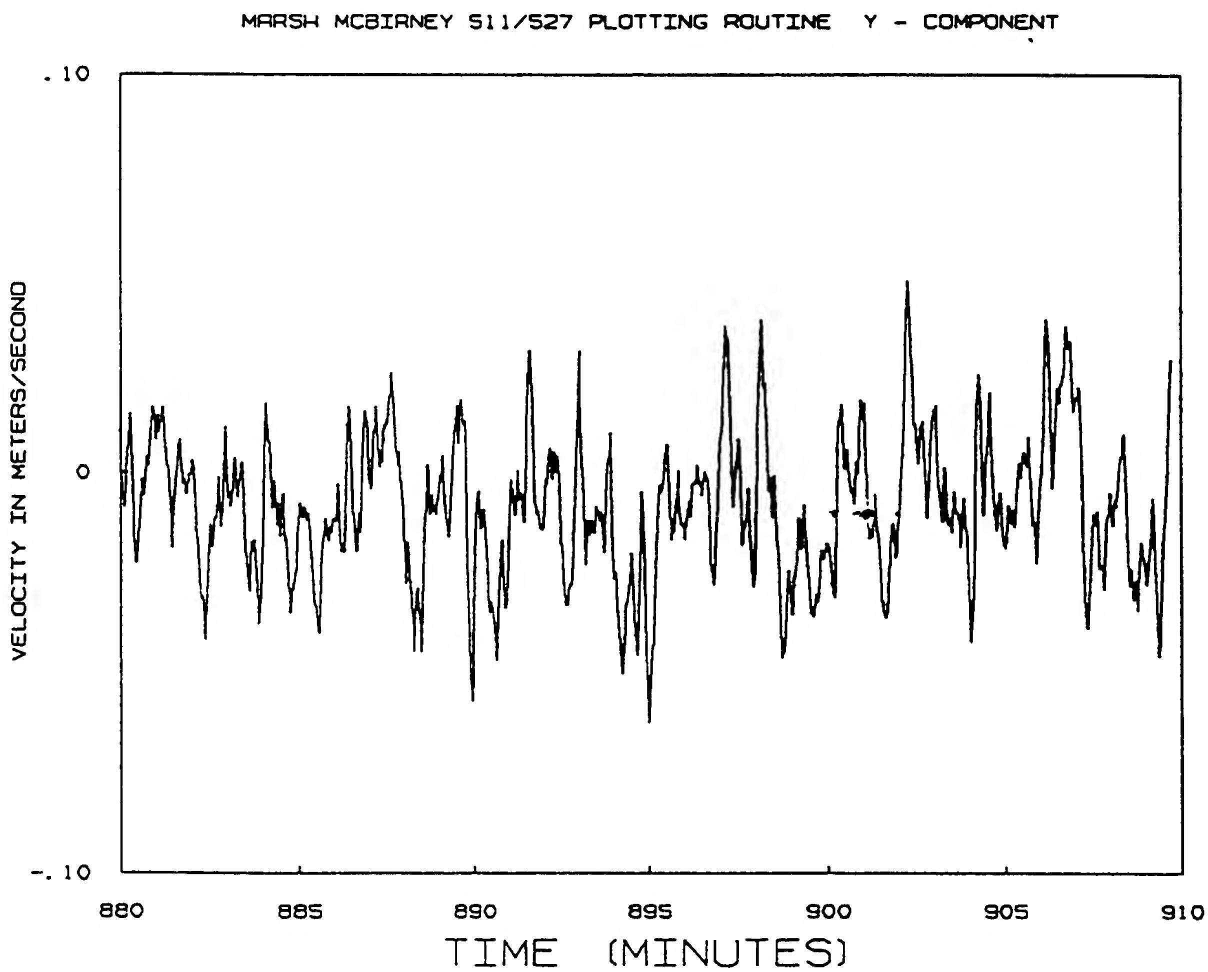
meter number	B-642	start-time	1440
tow name	d.ray miller	end-time	1510
configuration	3x3+2x1	mean = 0.00	
draft	7.1	vmax = 0.00	tmax = 897.
speed	4.9 mph	vmin = 0.00	tmin = 886.
direction	upstream		
distance	700		



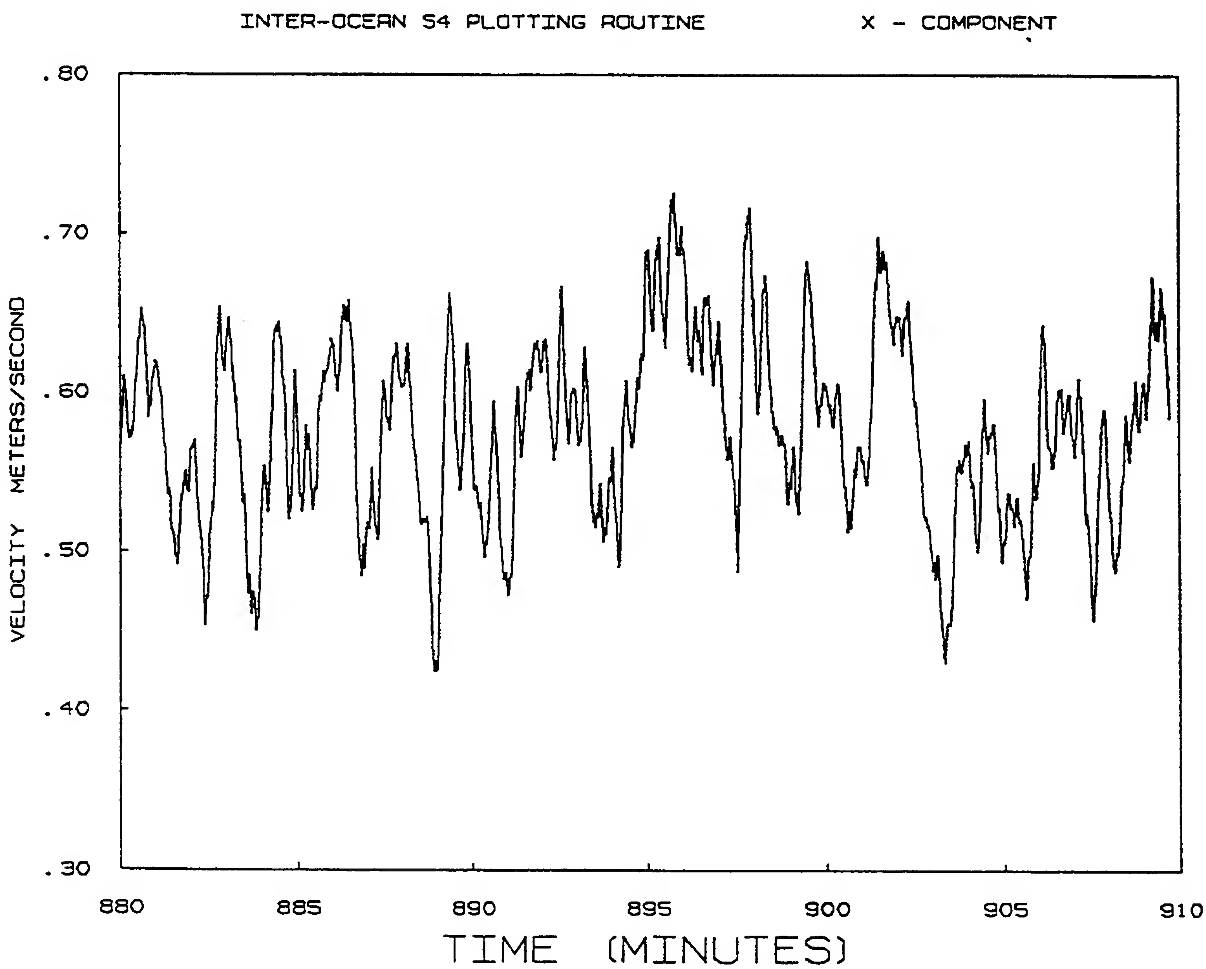
meter number	B-332	start-time	1440
tow name	d.ray miller	end-time	1510
configuration	3x3+2x1	mean =	0.39
draft	7.1	vmax =	0.00 tmax = 896.
speed	4.9 mph	vmin =	0.00 tmin = 892.
direction	upstream		
distance	700		



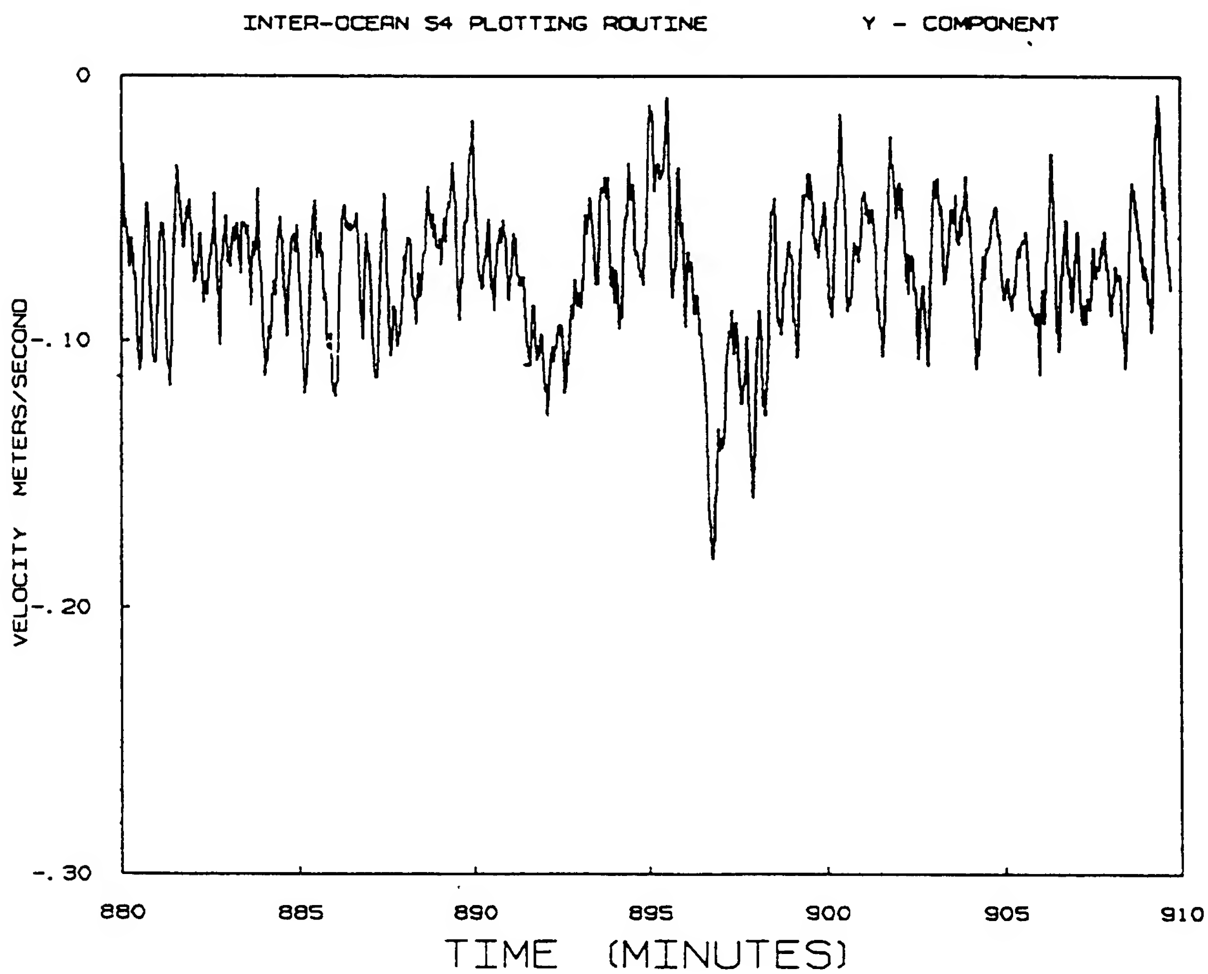
meter number	B-332	start-time	1440
tow name	d.ray miller	end-time	1510
configuration	3x3+2x1	mean = -0.01	
draft	7.1	vmax = 0.00	tmax = 902.
speed	4.9 mph	vmin = 0.00	tmin = 895.
direction	upstream		
distance	700		



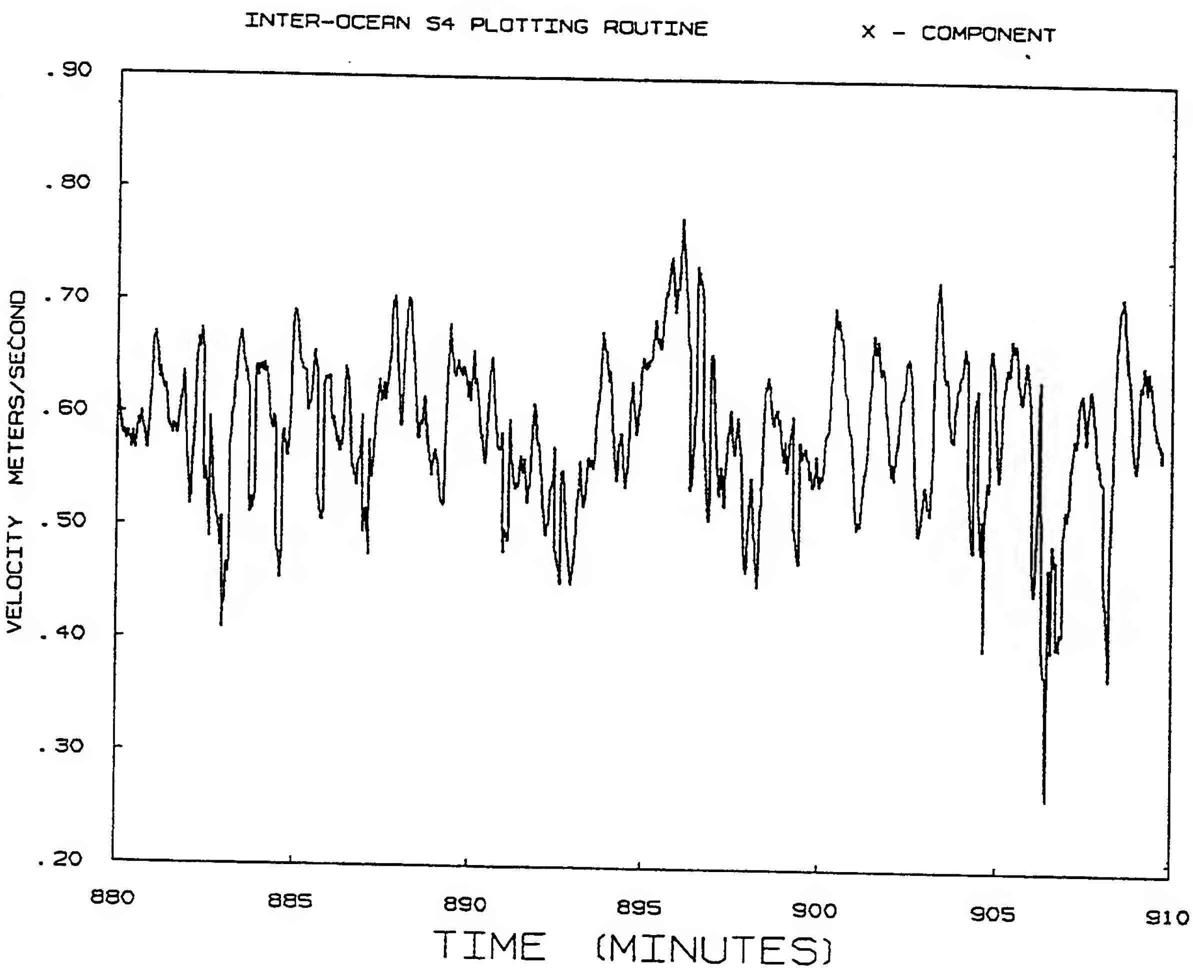
meter number	071	distance	700		
tow name	d. ray miller	start-time	1440		
configuration	3x3+2x1	end-time	1510		
draft	7.1	MEAN =	0.57		
speed	4.9 mph	VMAX =	0.73	TMAX =	896.
direction	upstream	VMIN =	0.42	TMIN =	889.



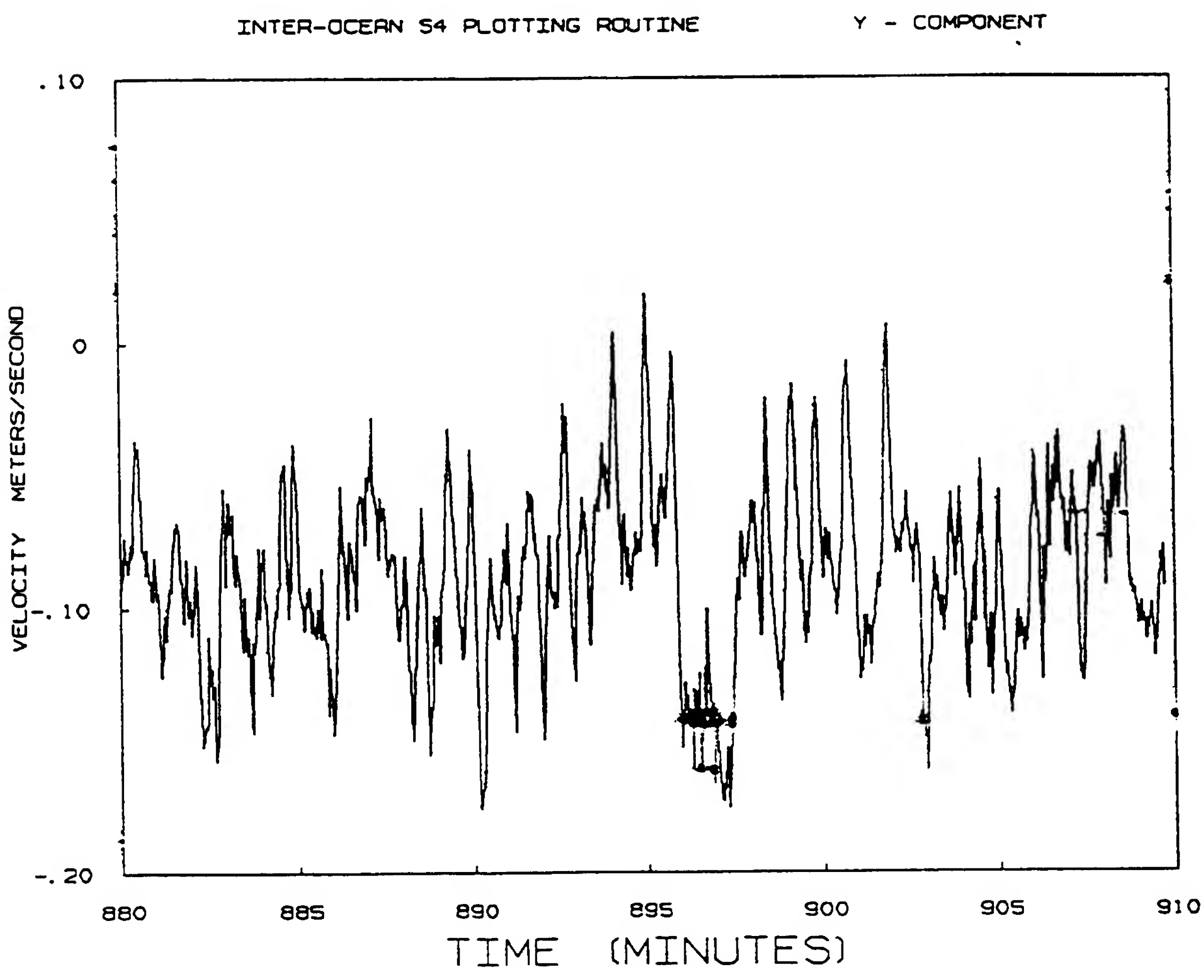
meter number	071	distance	700		
tow name	d. ray miller	start-time	1440		
configuration	3x3+2x1	end-time	1510		
draft	7.1	MEAN =	-0.07		
speed	4.9 mph	VMAX =	-0.01	TMAX =	909.
direction	upstream	VMIN =	-0.18	TMIN =	897.



meter number	040	distance	700				
tow name	d. ray miller	start-time	1440				
configuration	3x3+2x1	end-time	1510				
draft	7.1	MEAN	=	0.60			
speed	4.9 mph	VMAX	=	0.78	TMAX	=	896.
direction	upstream	VMIN	=	0.26	TMIN	=	906.



meter number	040	distance	700		
tow name	d. ray miller	start-time	1440		
configuration	3x3+2x1	end-time	1510		
draft	7.1	MEAN =	-0.09		
speed	4.9 mph	VMAX =	0.02	TMAX =	895.
direction	upstream	VMIN =	-0.18	TMIN =	890.



XX-3. Velocity fluctuations measured by two-dimensional current meters for barge *Hugh C. Blaske* at Goose Island, trip 1

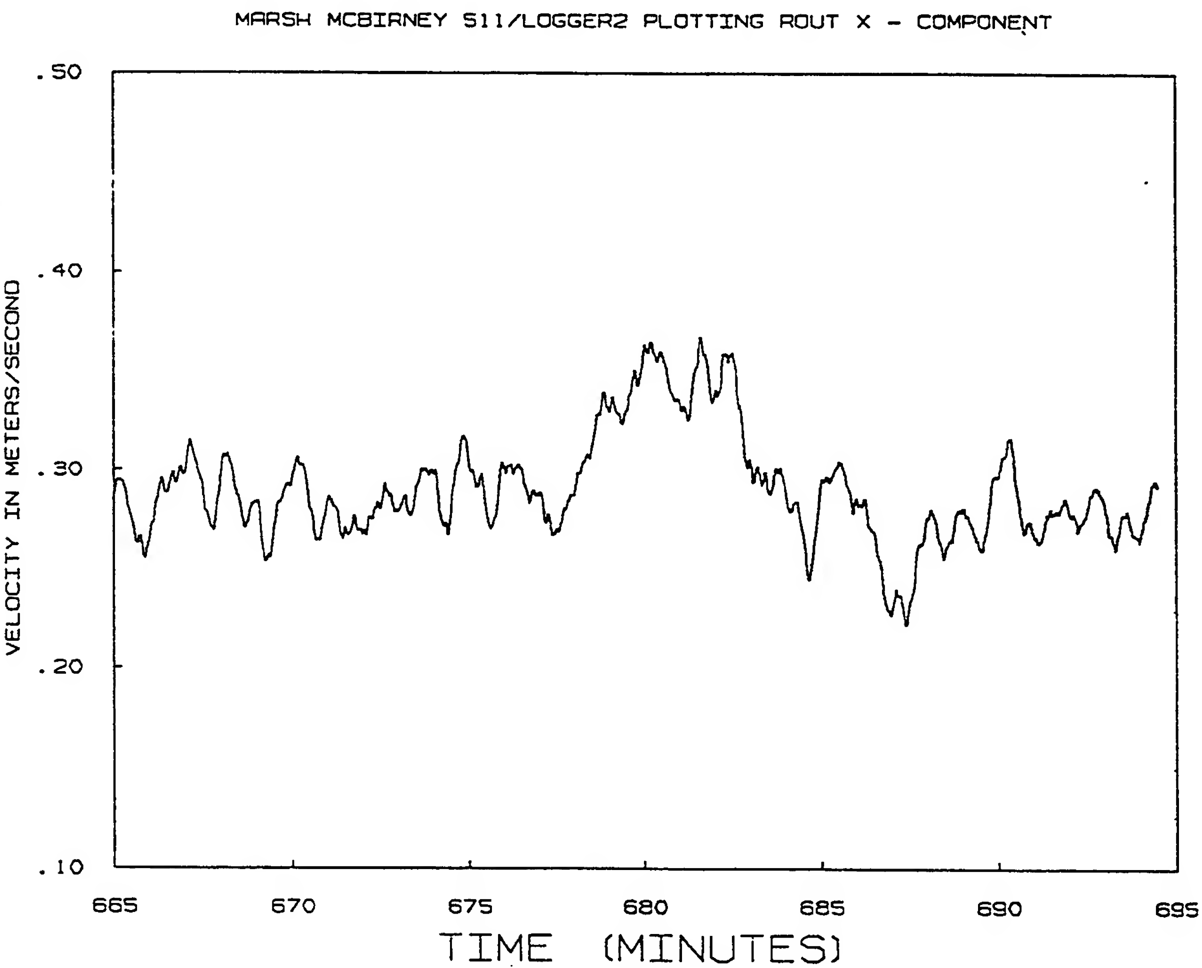
Hugh C. Blaske (8/25/90)

Status of Electromagnetic Current Meters:

1000 (MMB511) √	998 (MMB511) √	999 (MMB511) √	1001 (MMB511) √
642 (MMB527) √	332 (MMB527) √		
040 (S4) √	071 (S4) √		

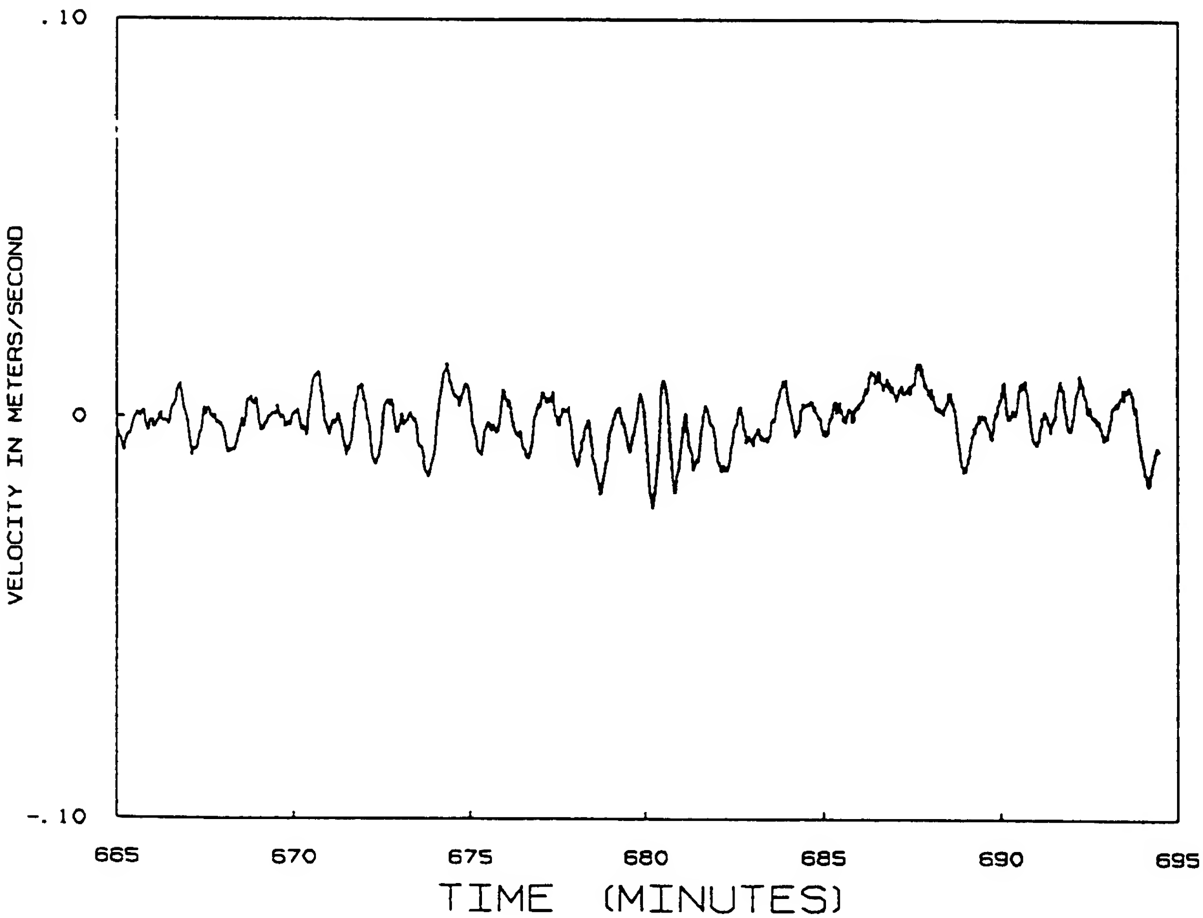
Note: √ : Working
* : Not working
- : Unavailable

meter number	1000	distance	310
tow name	hugh c.	start–time	1105
configuration	3x5	end–time	1135
draft	8.5	mean = 0.28	
speed	4.2 mph	vmax = 0.37	tmax = 682.
direction	upstream	vmin = 0.22	tmin = 687.

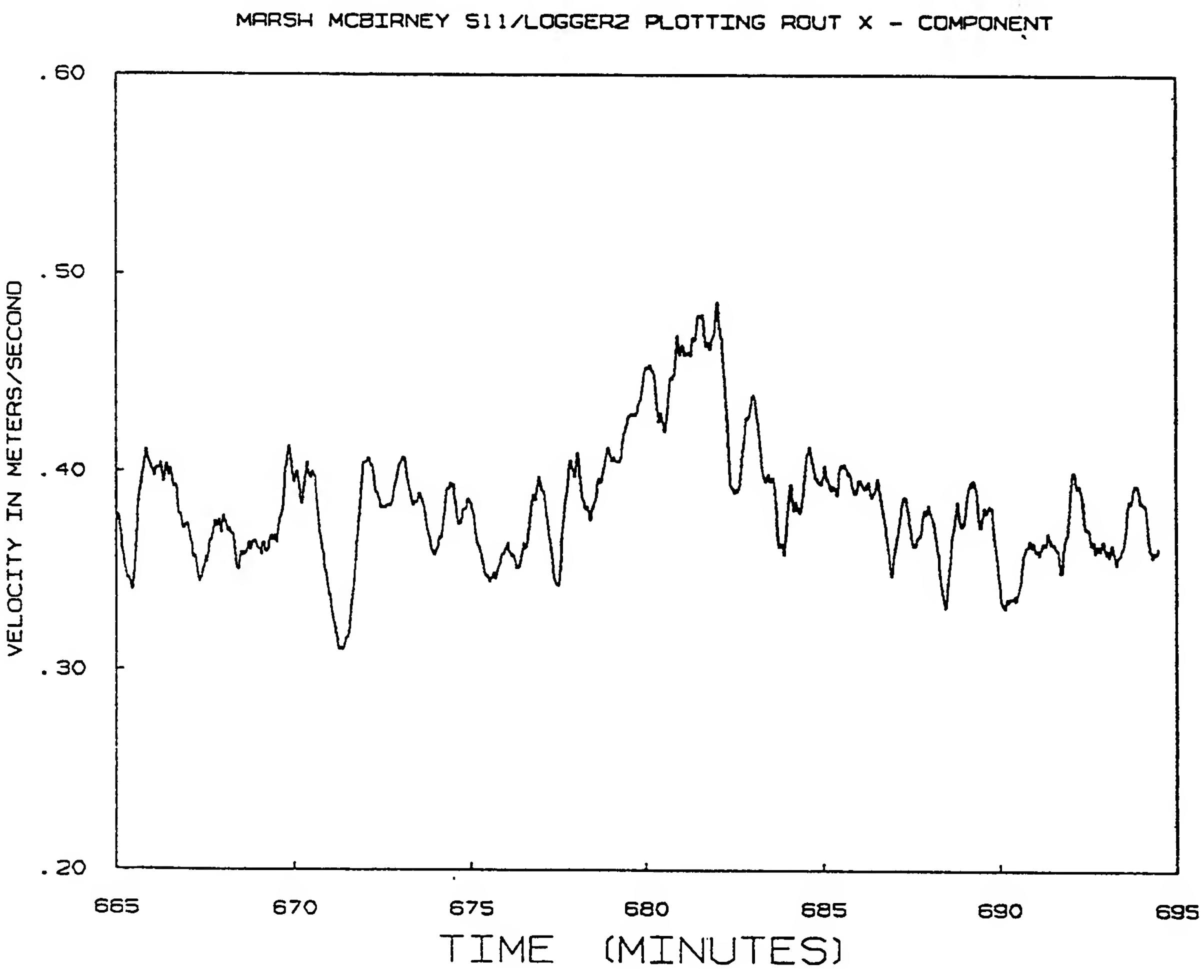


meter number	1000	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	mean = 0.00	
speed	4.2 mph	vmax = 0.01	tmax = 688.
direction	upstream	vmin = -0.02	tmin = 680.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

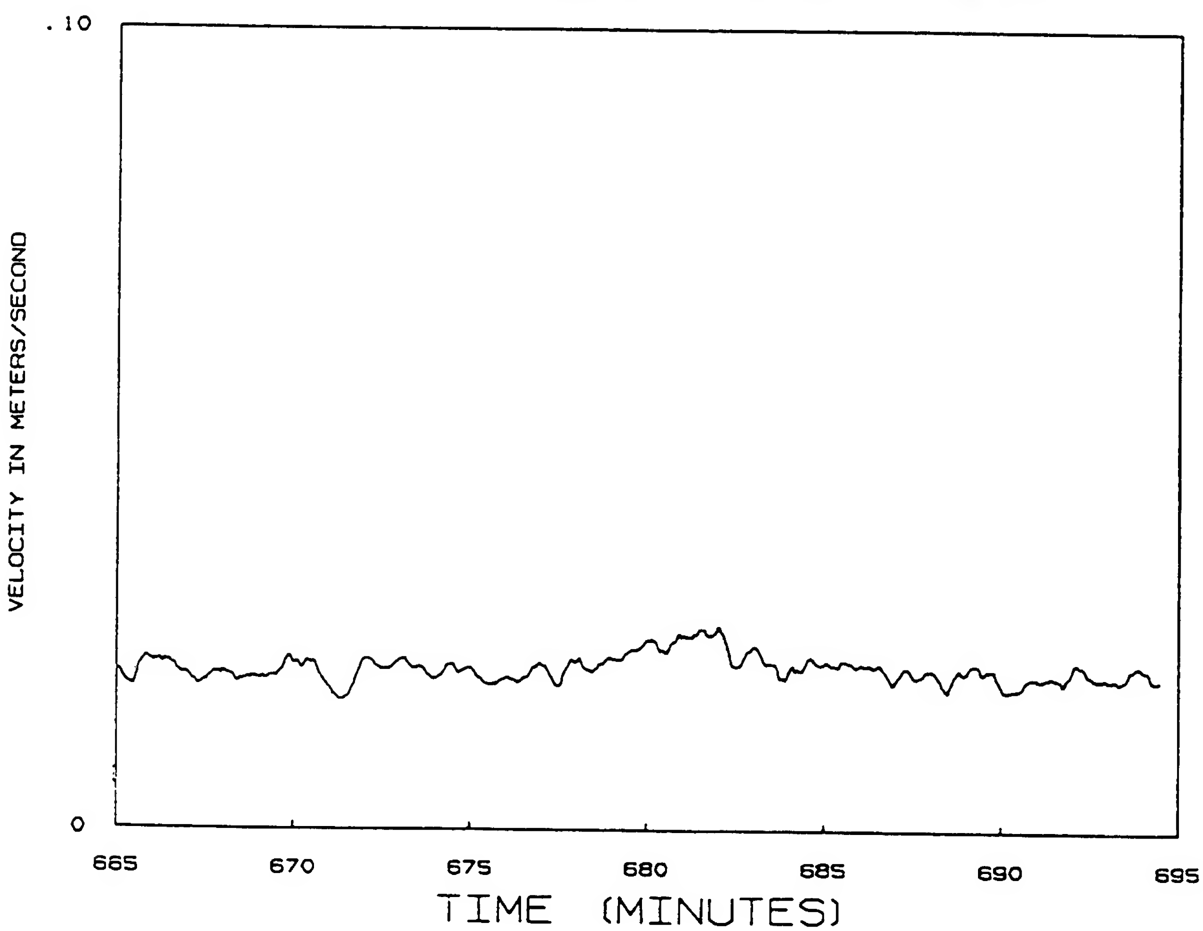


meter number	998	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	mean =	0.37
speed	4.2 mph	vmax =	0.49 tmax = 682.
direction	upstream	vmin =	0.31 tmin = 671.



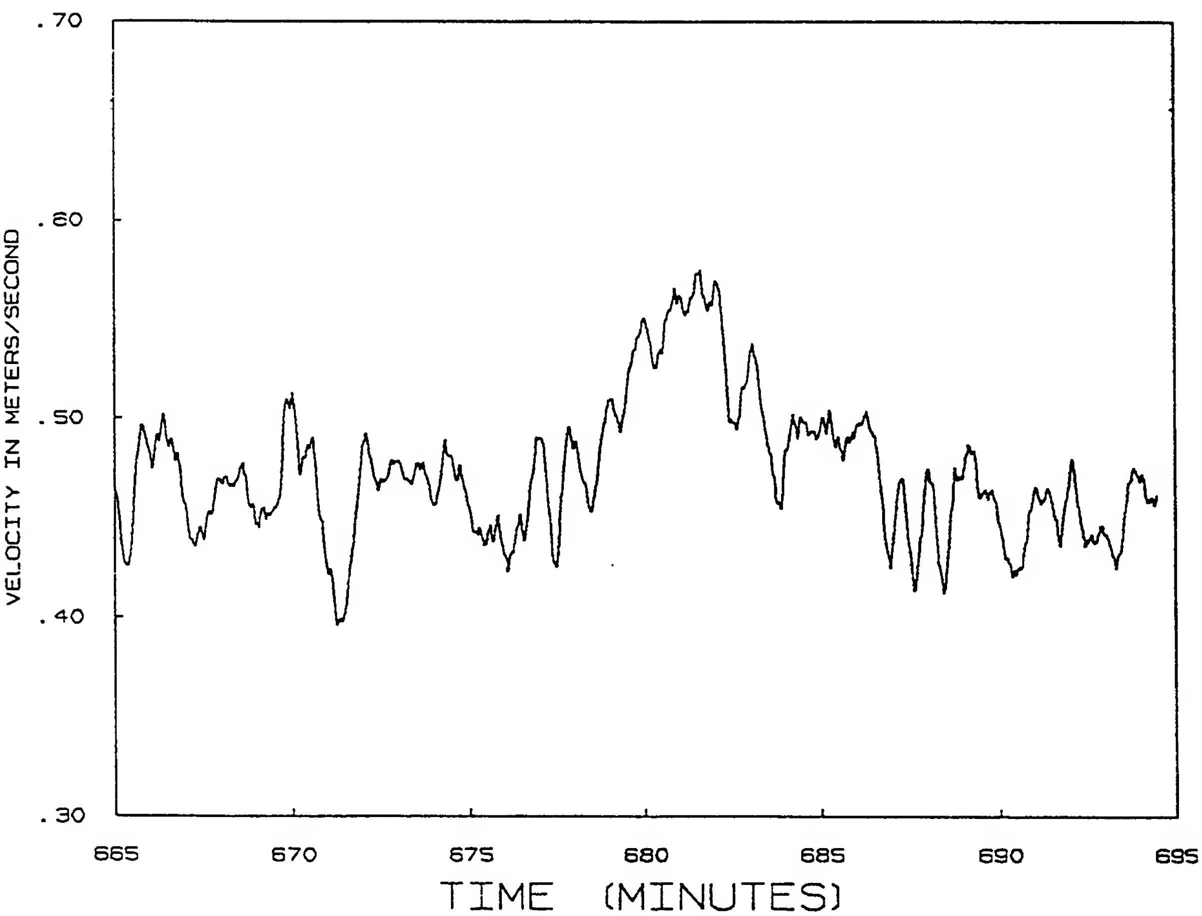
meter number	998	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	mean =	0.02
speed	4.2 mph	vmax =	0.03 tmax = 682.
direction	upstream	vmin =	0.02 tmin = 671.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

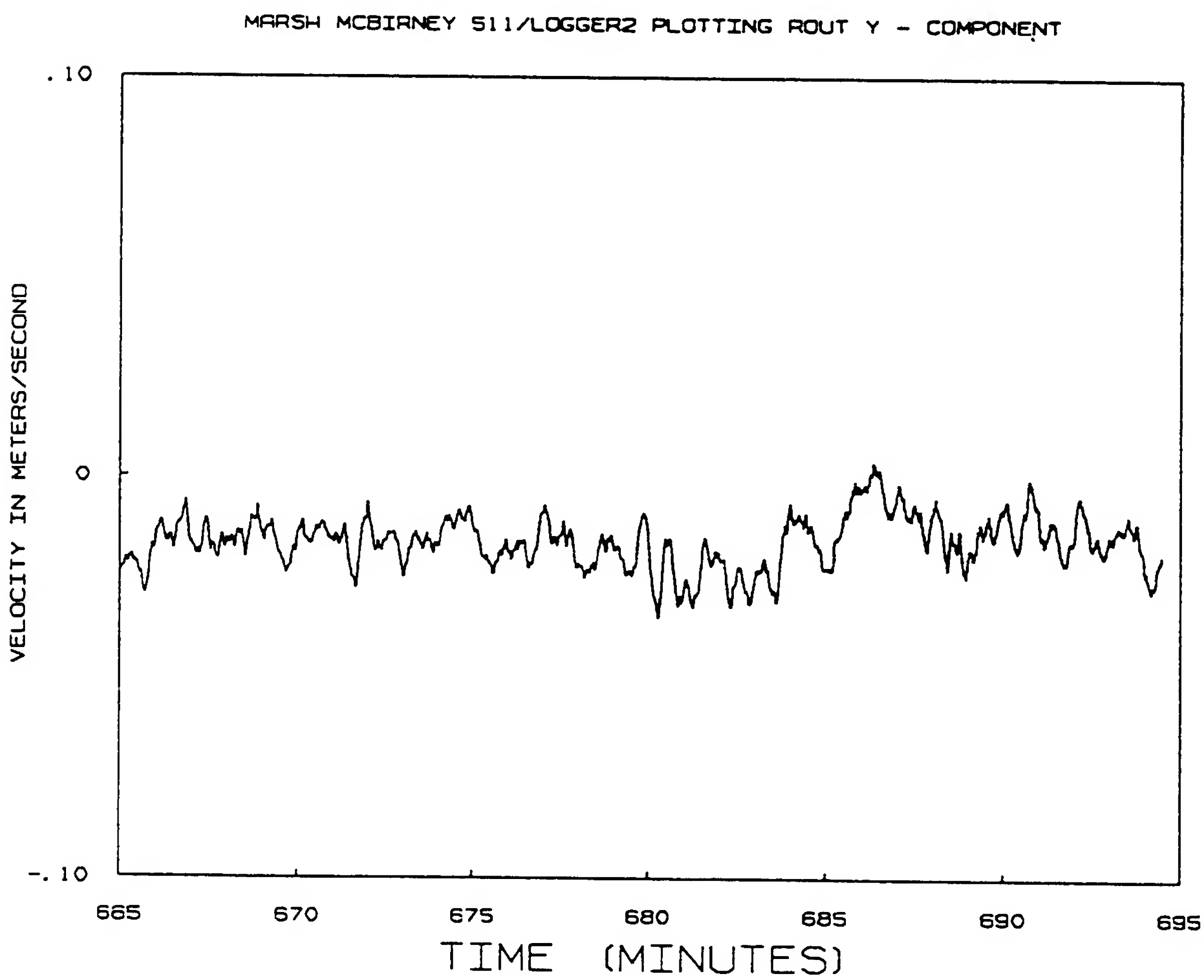


meter number	999	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	mean =	0.46
speed	4.2 mph	vmax =	0.58 tmax = 682.
direction	upstream	vmin =	0.40 tmin = 671.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

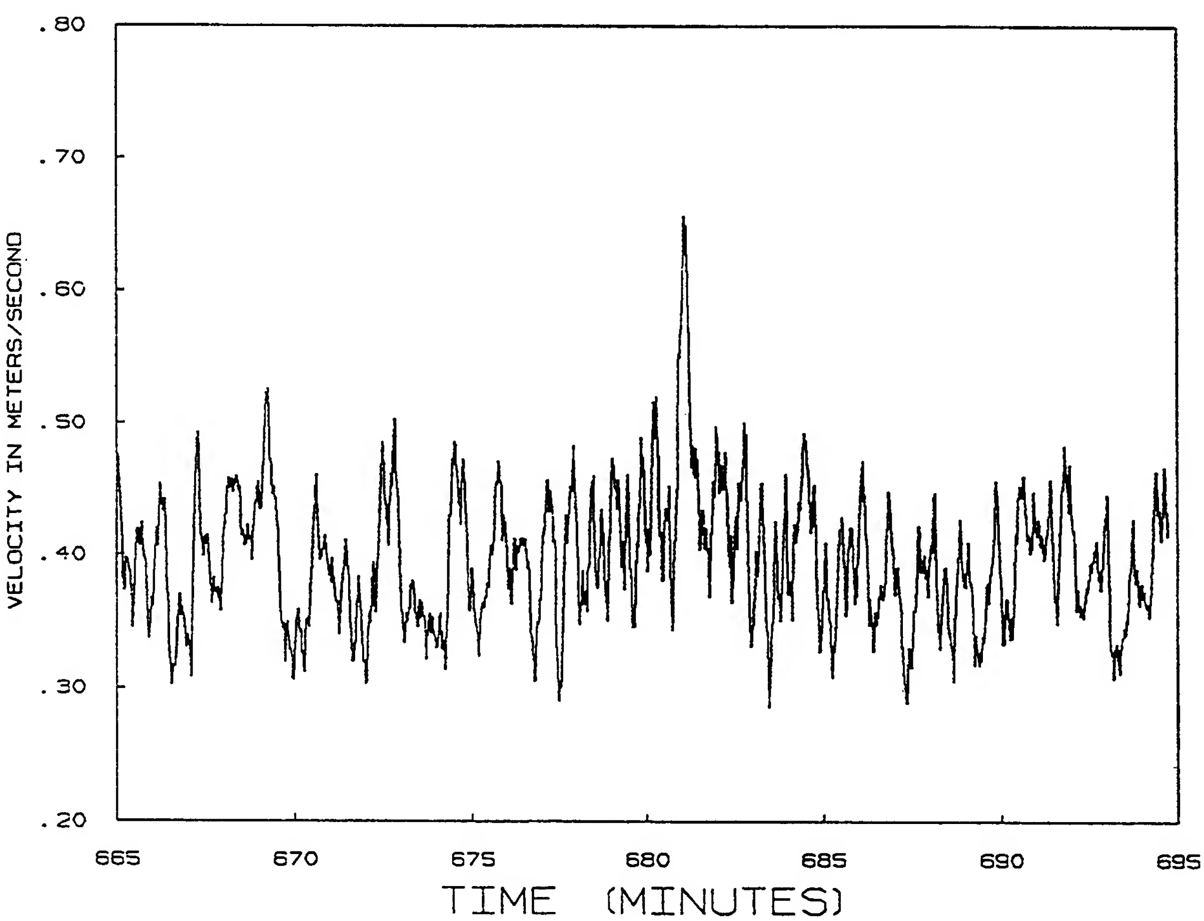


meter number	999	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	mean = −0.02	
speed	4.2 mph	vmax = 0.00	tmax = 686.
direction	upstream	vmin = −0.03	tmin = 680.

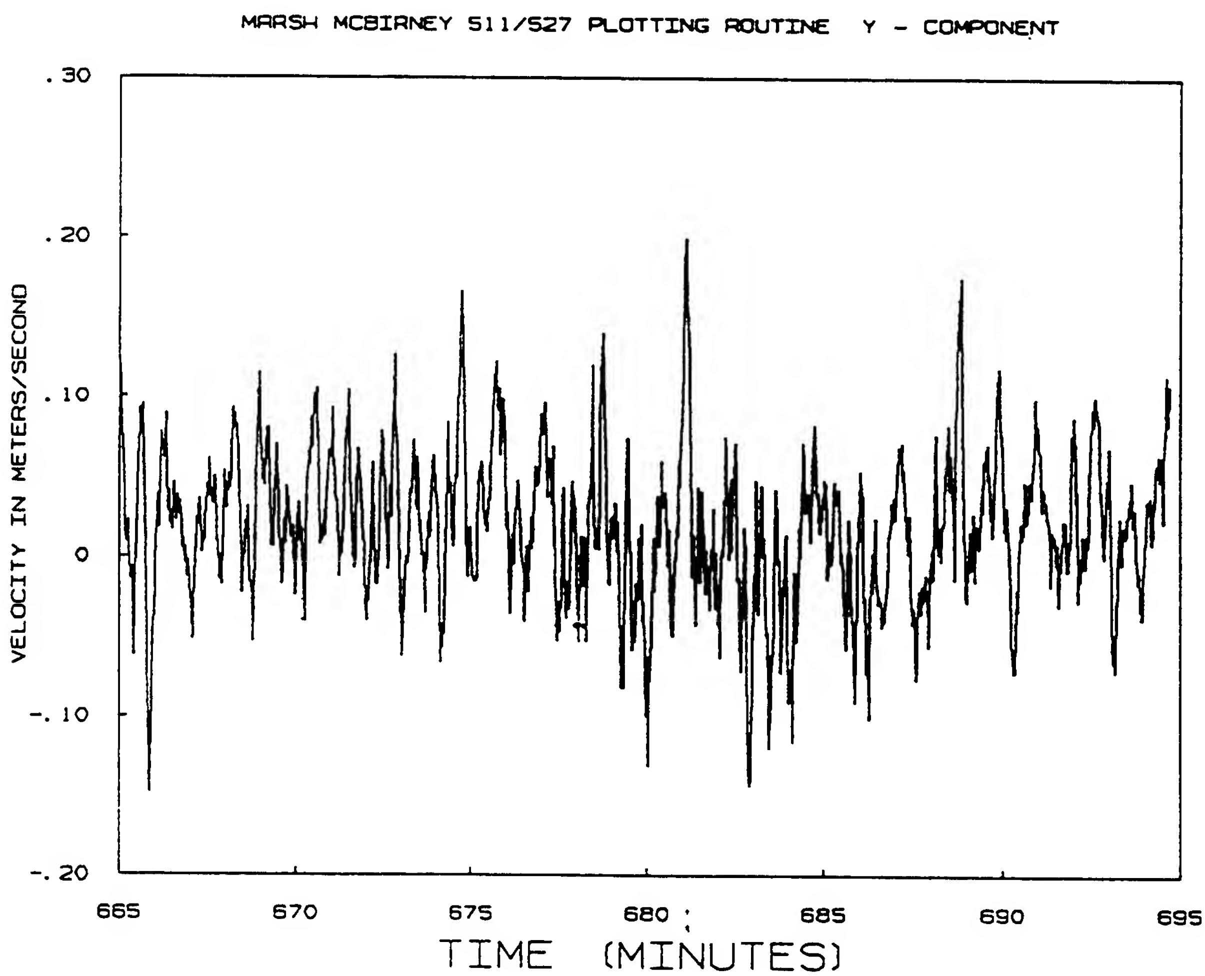


meter number	511-1001	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean = 0.39	
draft	8.5	vmax = 0.00	tmax = 681.
speed	4.2 mph	vmin = 0.00	tmin = 683.
direction	upstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

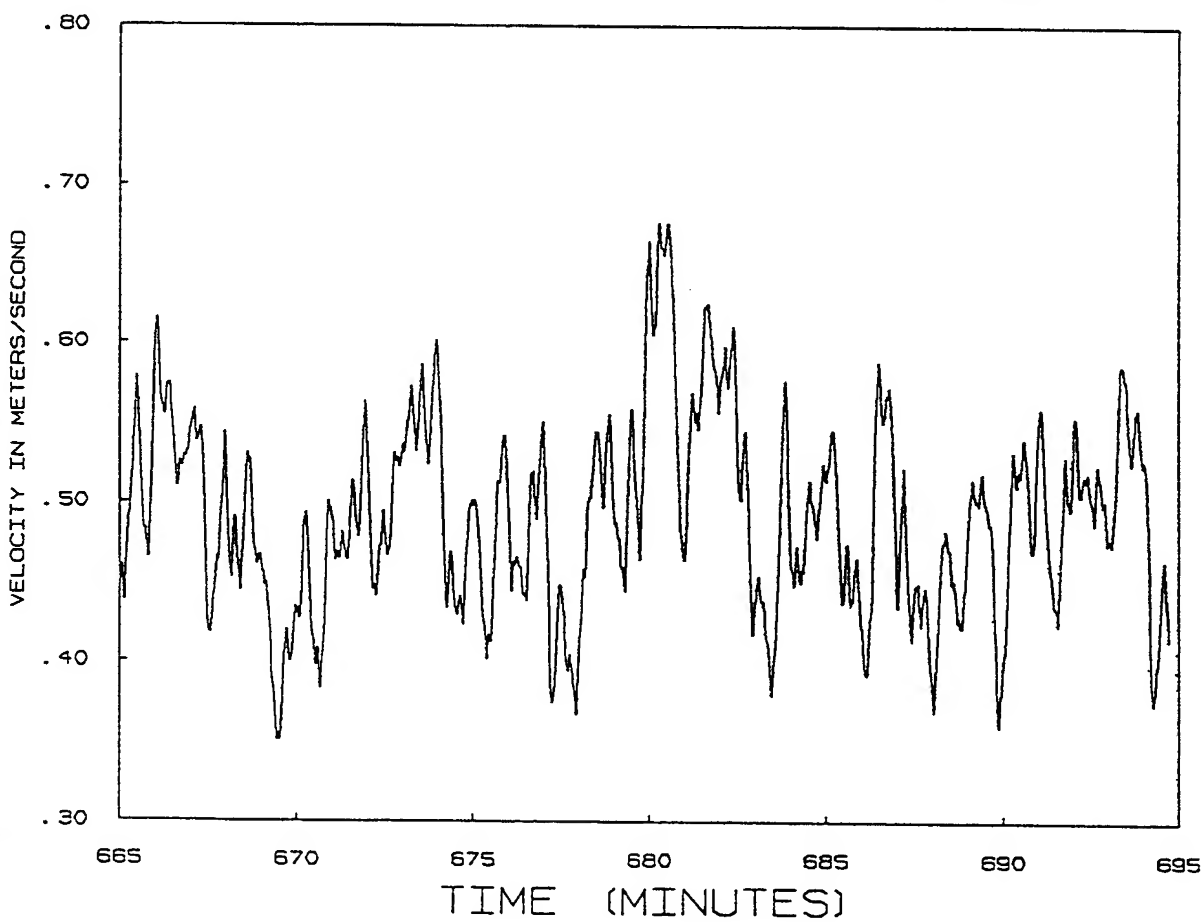


meter number	511-1001	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean = 0.03	
draft	8.5	vmax = 0.00	tmax = 681.
speed	4.2 mph	vmin = 0.00	tmin = 666.
direction	upstream		
distance	310		



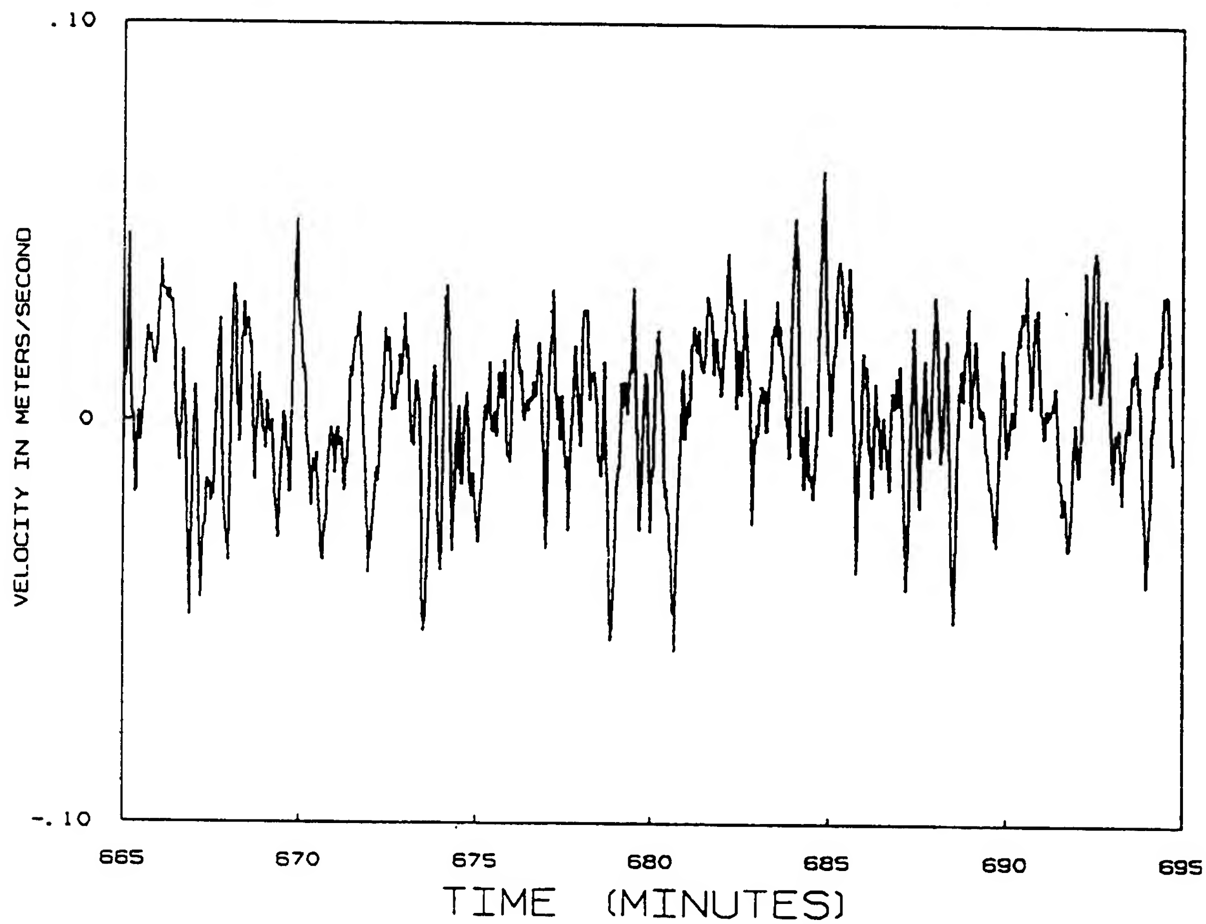
meter number	B-642	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean =	0.49
draft	8.5	vmax =	0.00 tmax = 680.
speed	4.2 mph	vmin =	0.00 tmin = 670.
direction	upstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



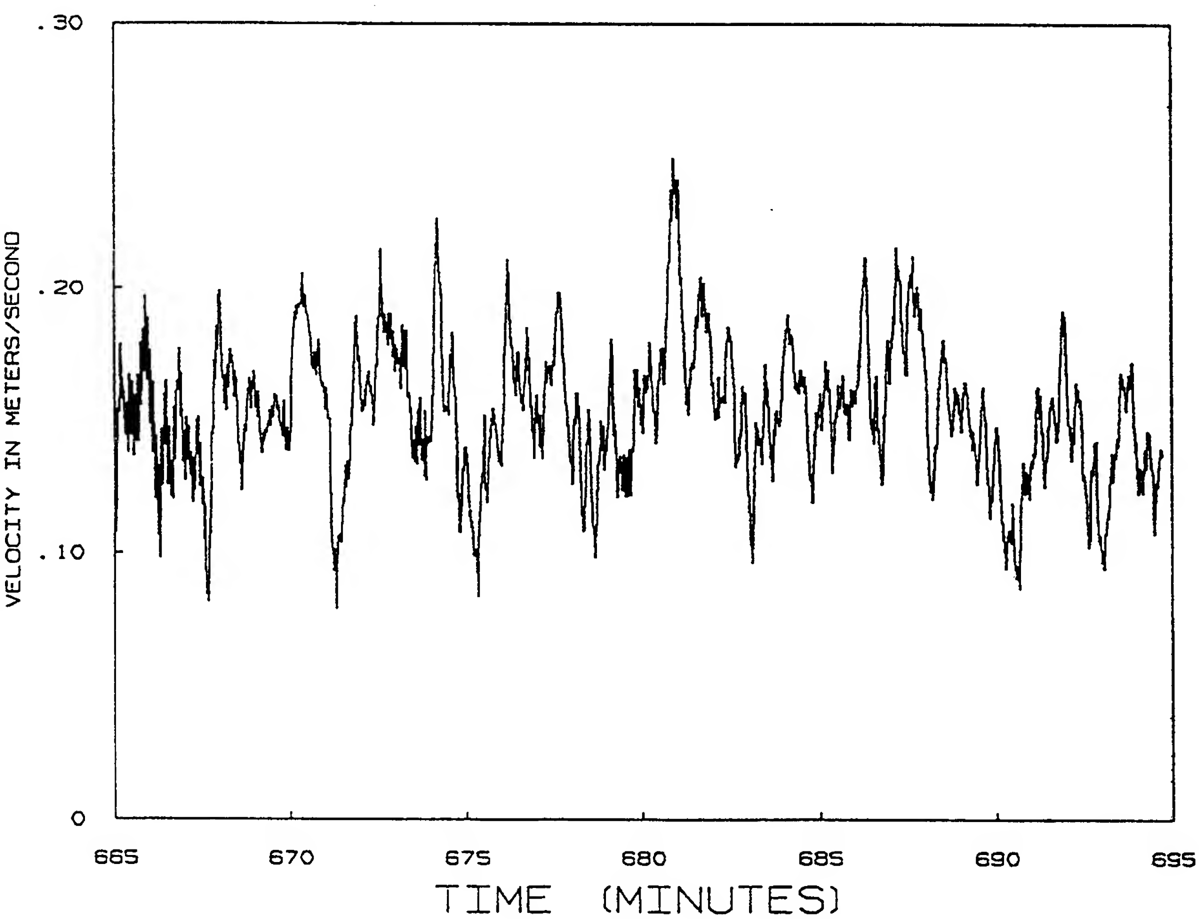
meter number	B-642	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean = 0.00	
draft	8.5	vmax = 0.00	tmax = 685.
speed	4.2 mph	vmin = 0.00	tmin = 681.
direction	upstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



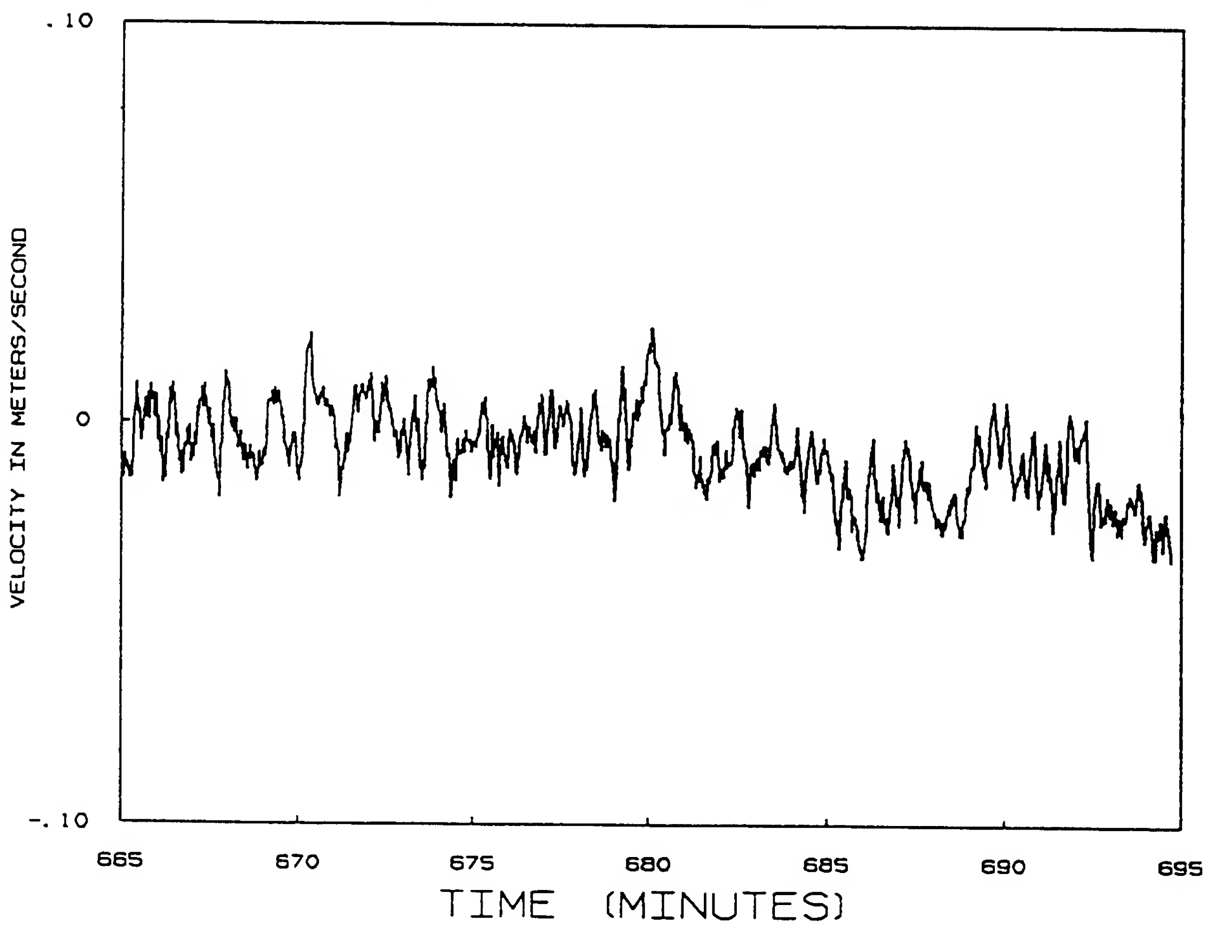
meter number	B-332	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean = 0.15	
draft	8.5	vmax = 0.00	tmax = 681.
speed	4.2 mph	vmin = 0.00	tmin = 671.
direction	upstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

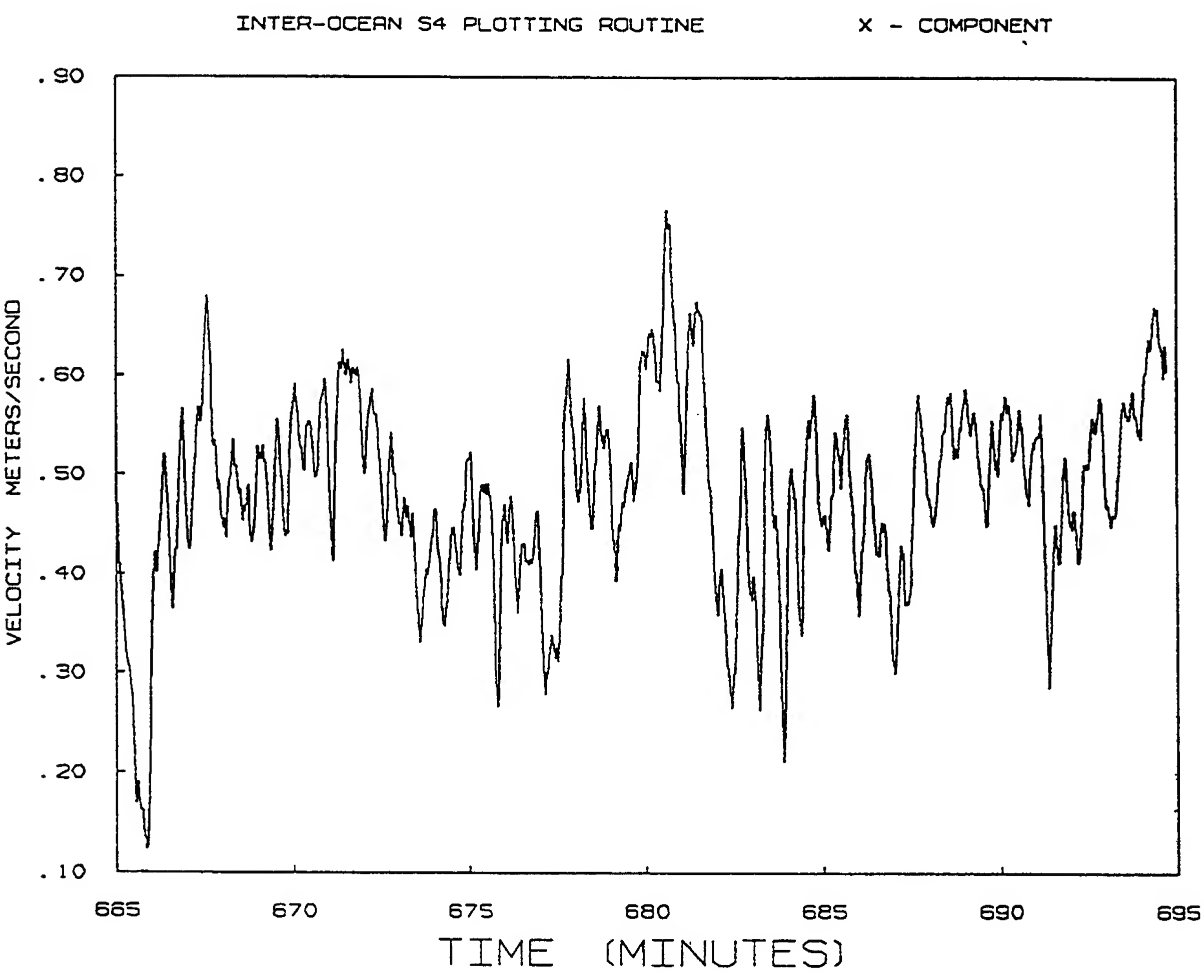


meter number	B-332	start-time	1105
tow name	hugh c.	end-time	1135
configuration	3x5	mean =	0.00
draft	8.5	vmax =	0.00 tmax = 680.
speed	4.2 mph	vmin =	0.00 tmin = 695.
direction	upstream		
distance	310		

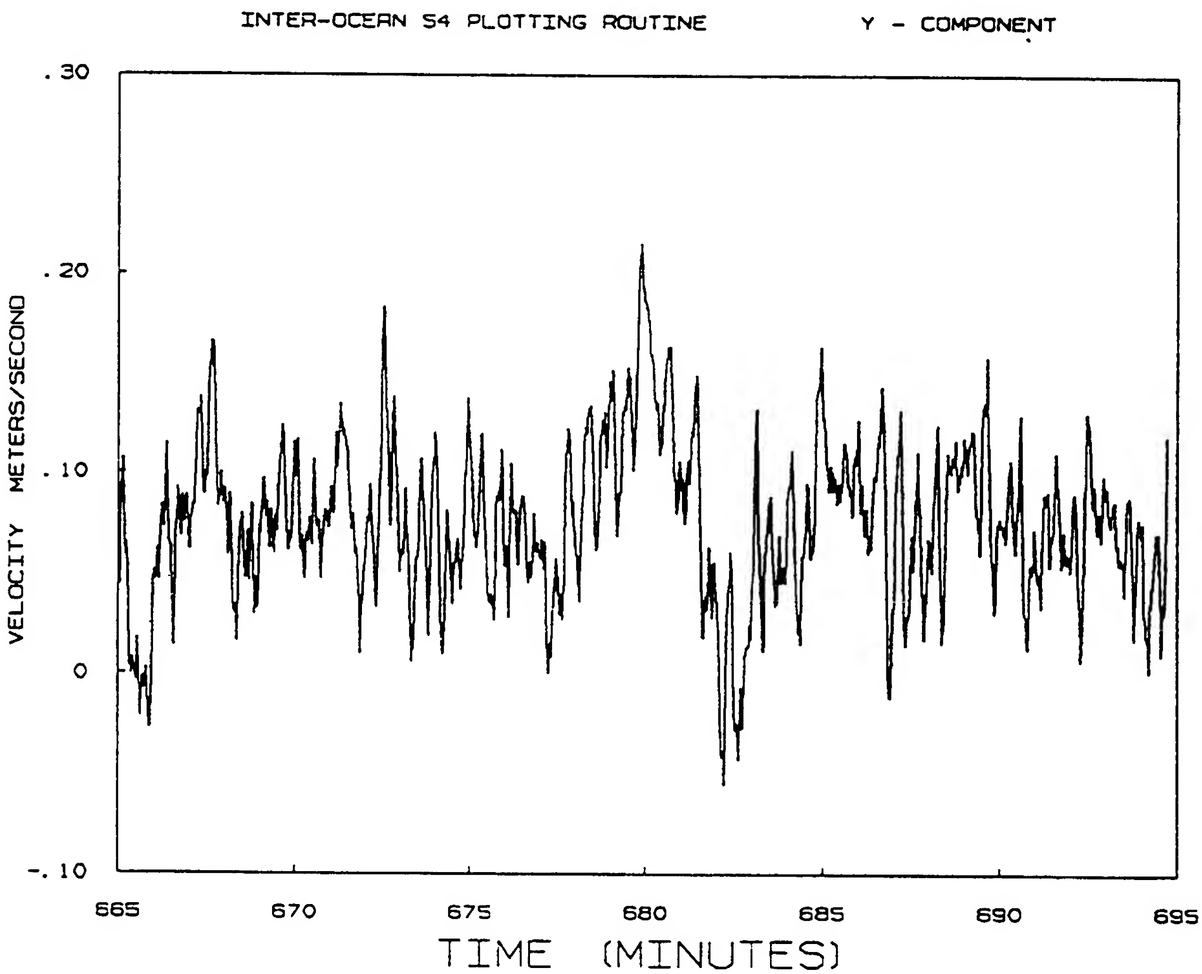
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



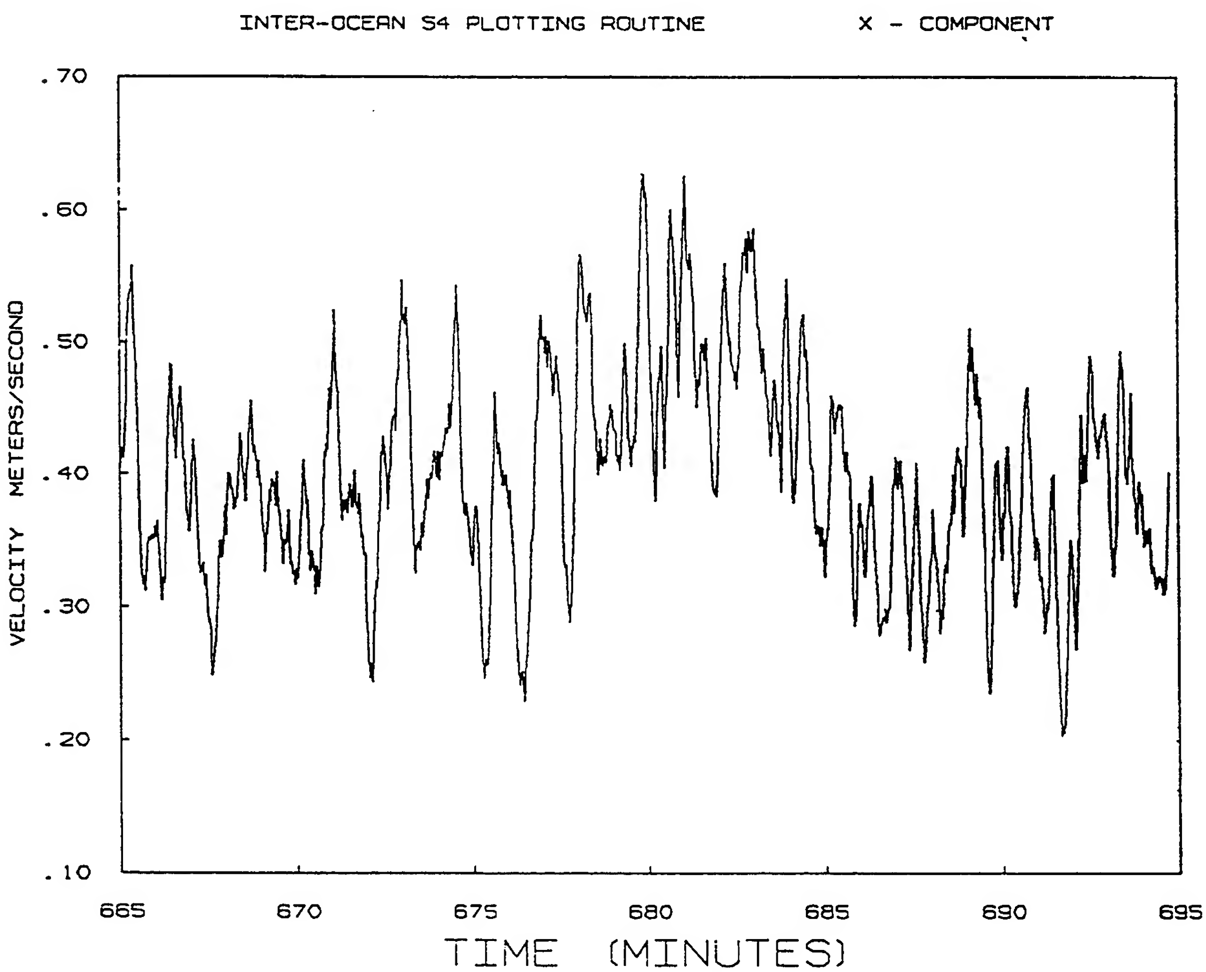
meter number	040	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	MEAN = 0.47	
speed	4.2 mph	VMAX = 0.77	TMAX = 681.
direction	upstream	VMIN = 0.12	TMIN = 666.



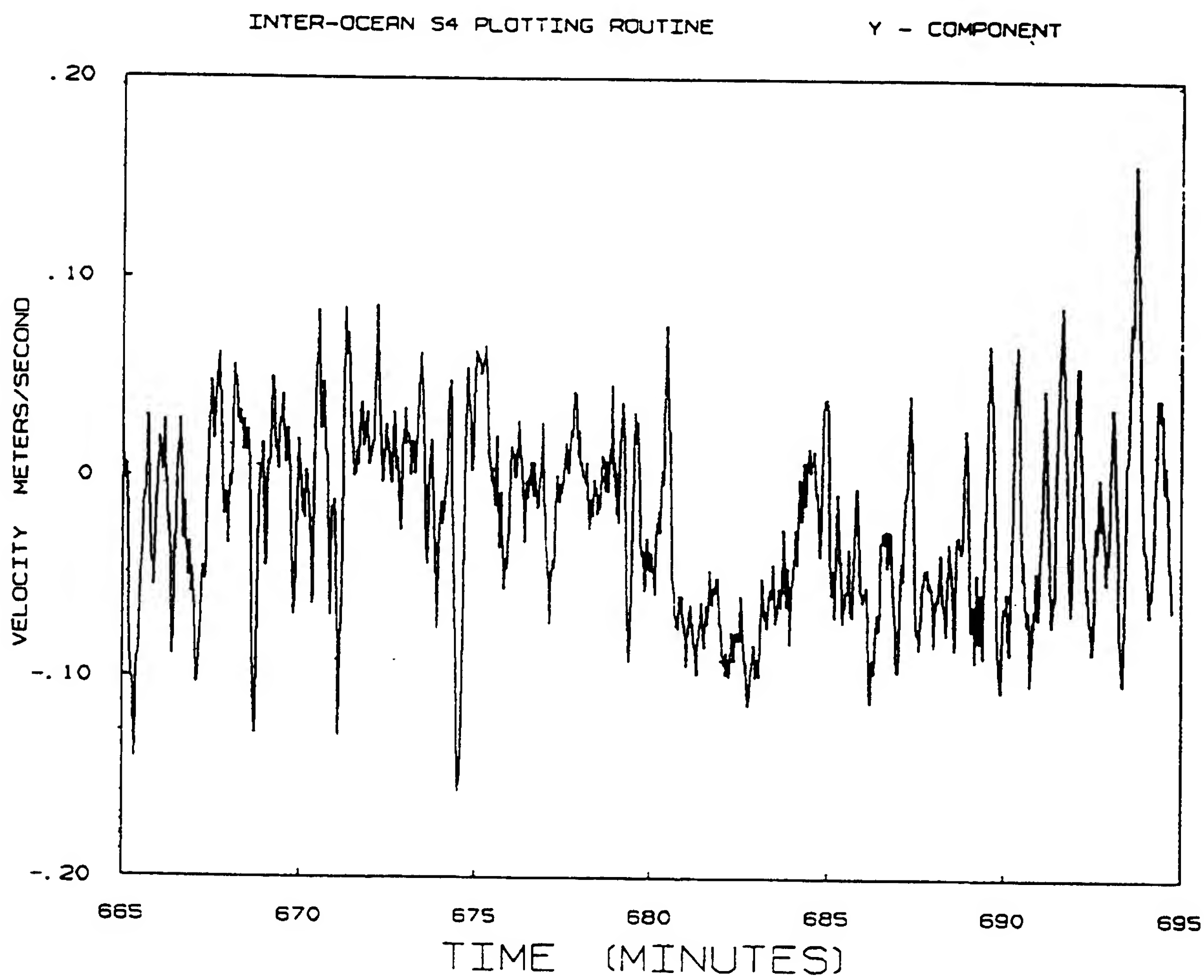
meter number	040	distance	310		
tow name	hugh c.	start-time	1105		
configuration	3x5	end-time	1135		
draft	8.5	MEAN =	0.07		
speed	4.2 mph	VMAX =	0.22	TMAX =	680.
direction	upstream	VMIN =	−0.06	TMIN =	682.



meter number	071	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	MEAN = 0.39	
speed	4.2 mph	VMAX = 0.63	TMAX = 680.
direction	upstream	VMIN = 0.20	TMIN = 692.



meter number	071	distance	310
tow name	hugh c.	start-time	1105
configuration	3x5	end-time	1135
draft	8.5	MEAN = −0.01	
speed	4.2 mph	VMAX = 0.16	TMAX = 694.
direction	upstream	VMIN = −0.16	TMIN = 674.



XX-4. Velocity fluctuations measured by two-dimensional current meters for barge *Jeff Boat* at Kampsville, trip 1

Jeff Boat (10/14/90)

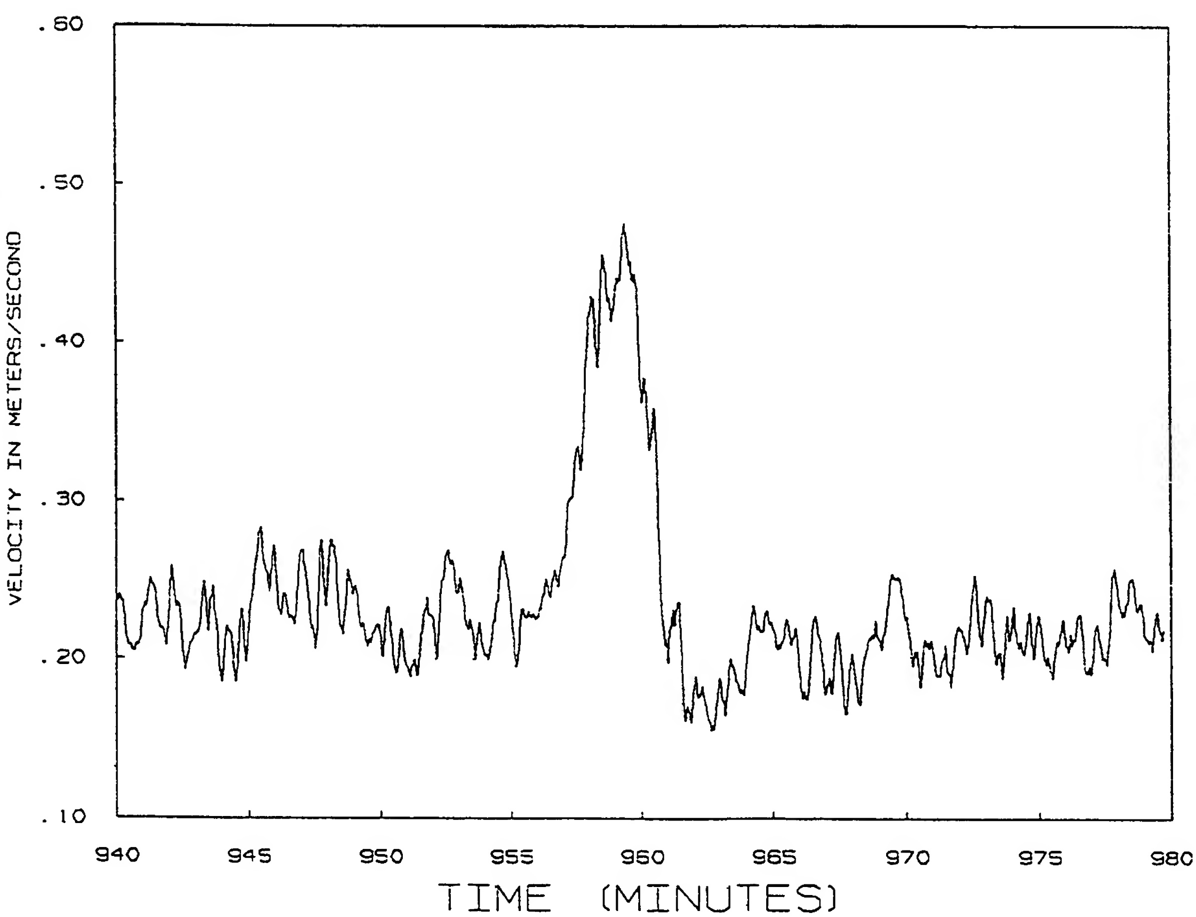
Status of Electromagnetic Current Meters:

1001 (MMB511) √	998 (MMB511) √	999 (MMB511) √	1000 (MMB511) √
332 (MMB527) √	642 (MMB527) √		
040 (S4) √	071 (S4) √		

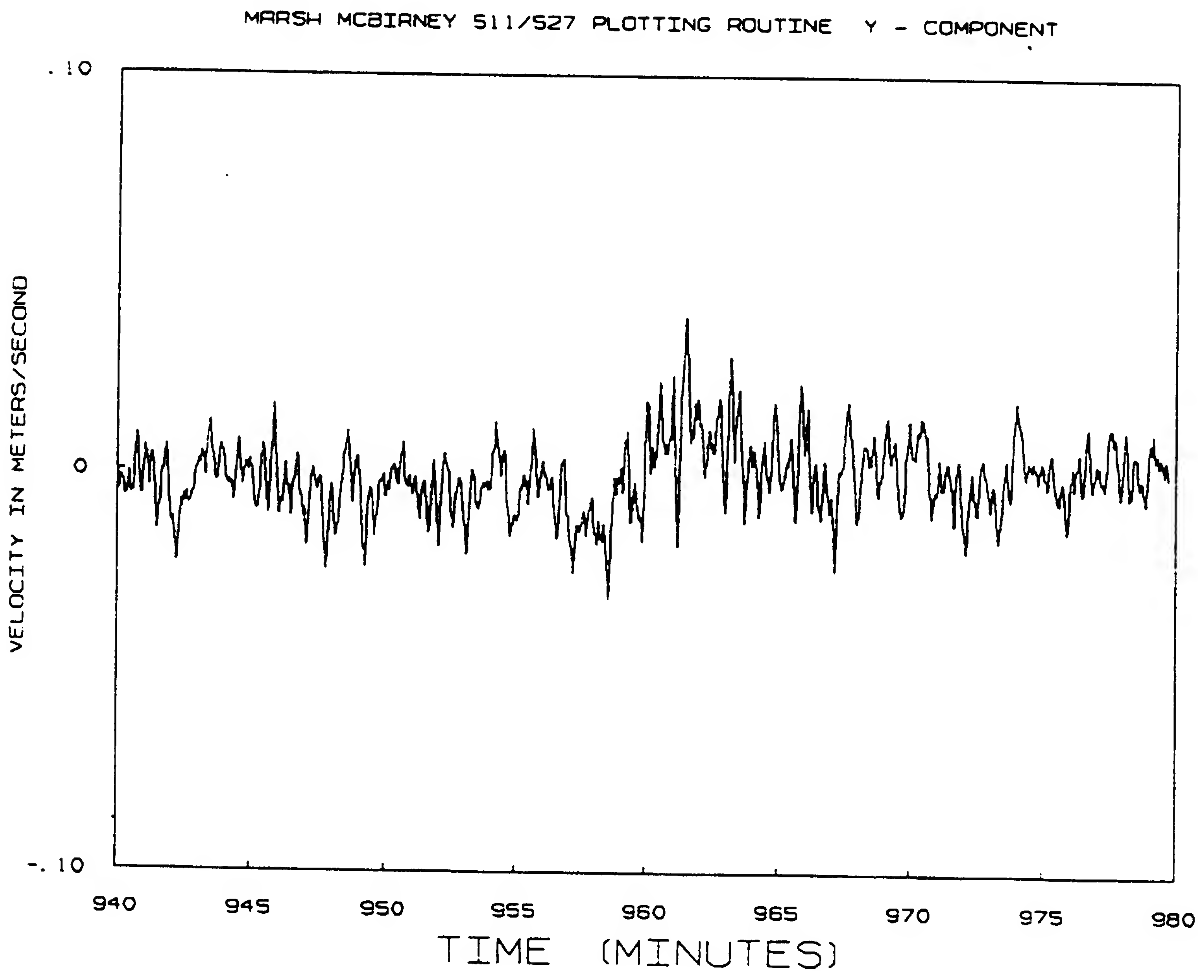
Note: √ : Working
* : Not working

meter number	511-1001	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean =	0.23
draft	9.0	vmax =	0.00 tmax = 959.
speed	4.2 mph	vmin =	0.00 tmin = 963.
direction	upstream		
distance	375		

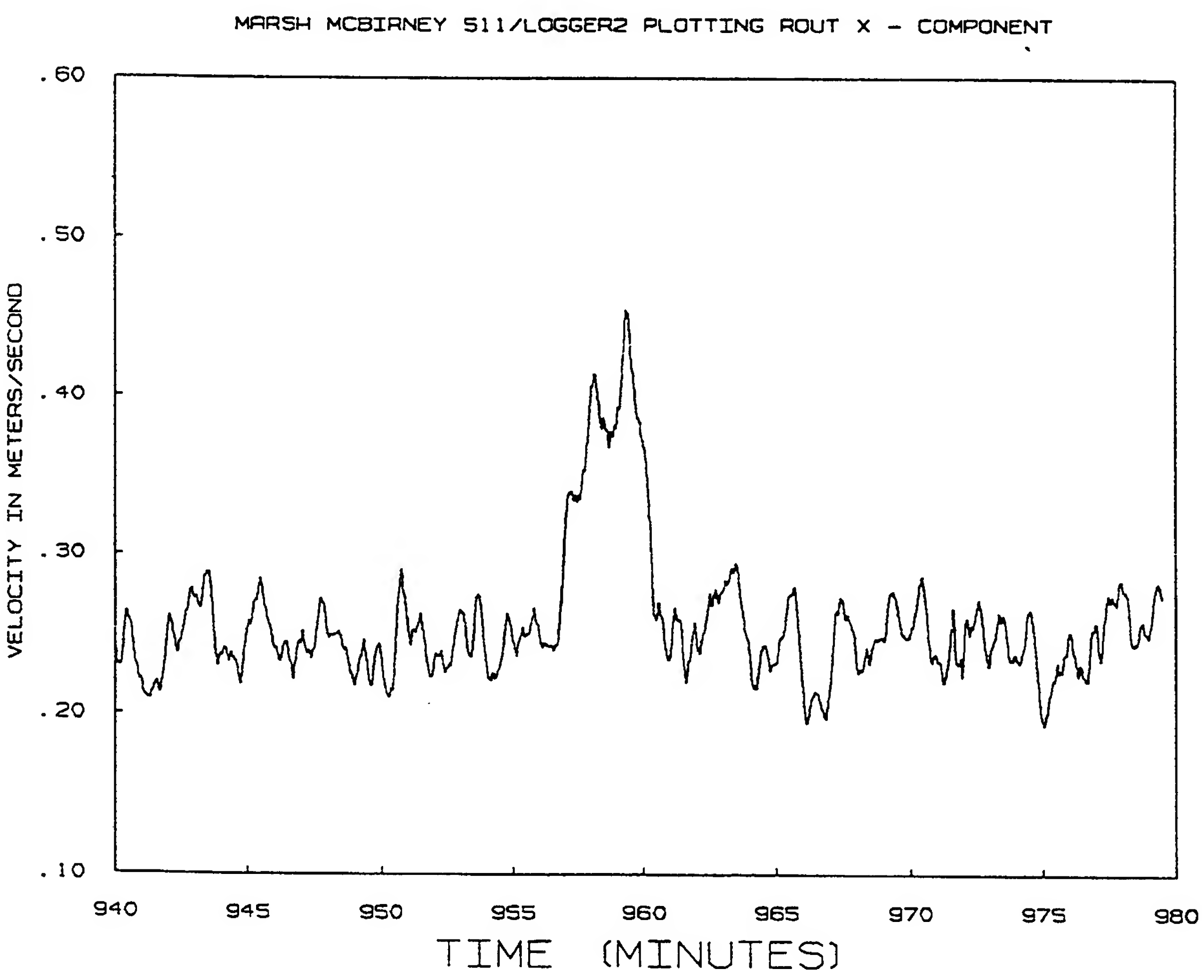
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



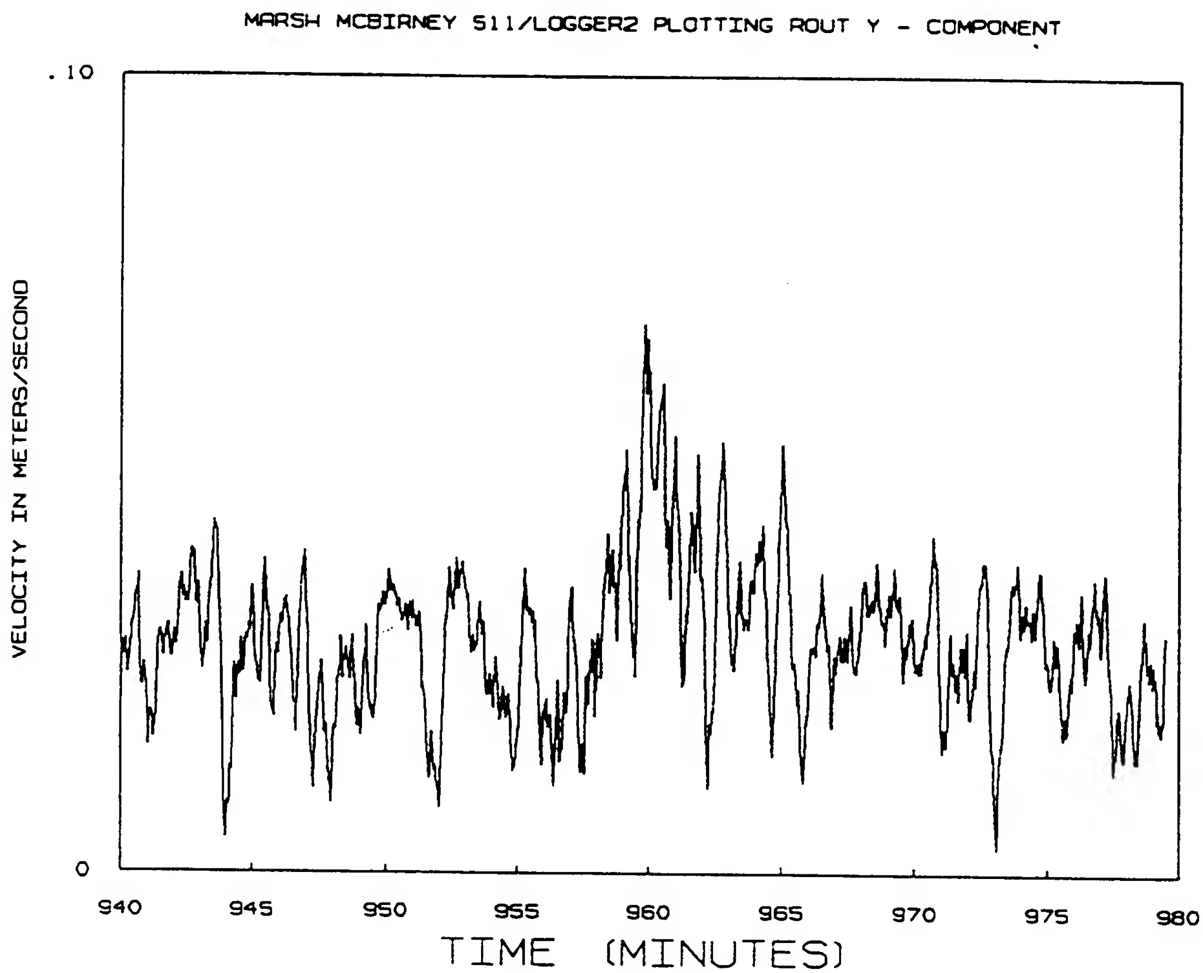
meter number	511-1001	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean =	0.00
draft	9.0	vmax =	0.00 tmax = 961.
speed	4.2 mph	vmin =	0.00 tmin = 959.
direction	upstream		
distance	375		



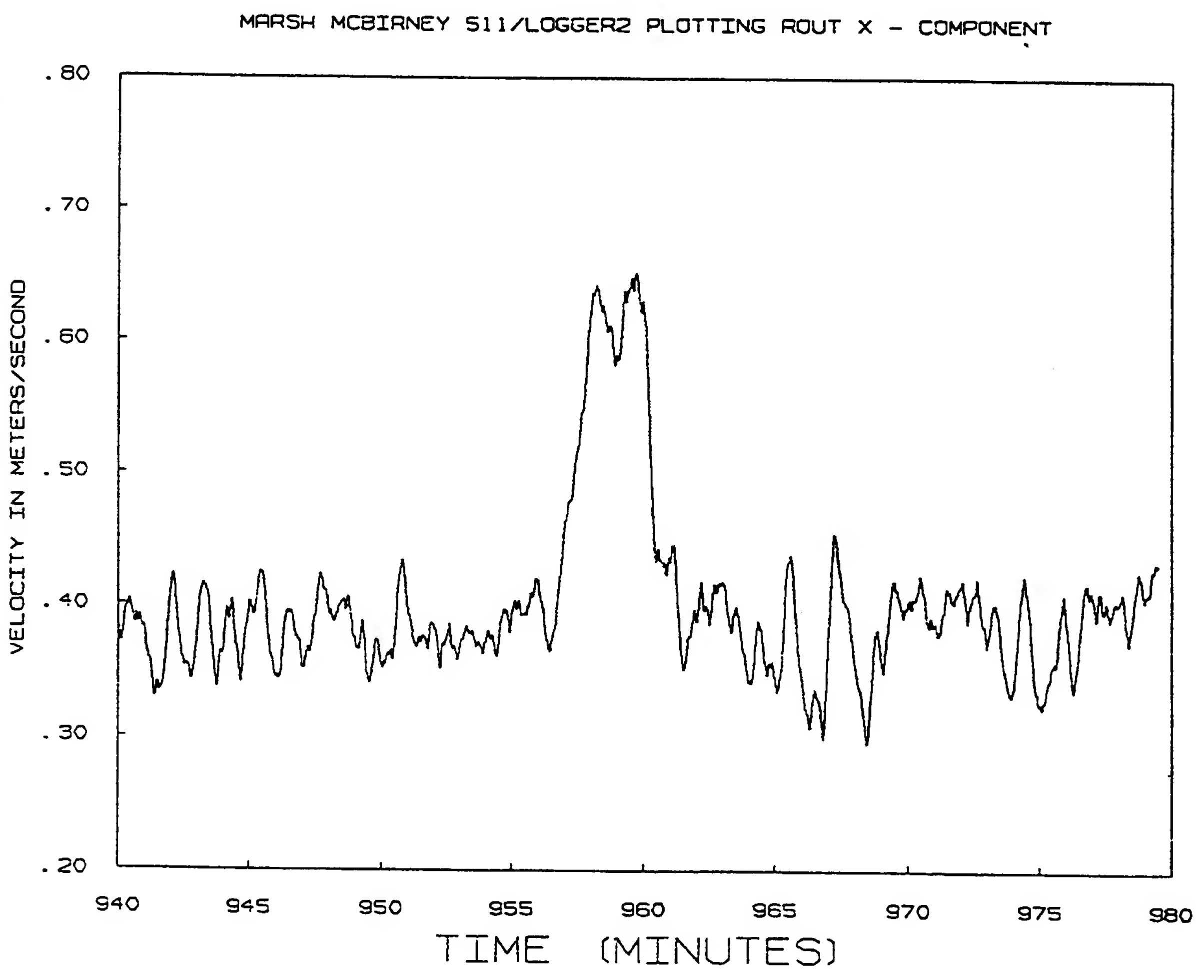
meter number	998	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	mean = 0.24	
speed	4.2 mph	vmax = 0.45	tmax = 959.
direction	upstream	vmin = 0.19	tmin = 975.



meter number	998	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	mean =	0.03
speed	4.2 mph	vmax =	0.07 tmax = 960.
direction	upstream	vmin =	0.00 tmin = 973.

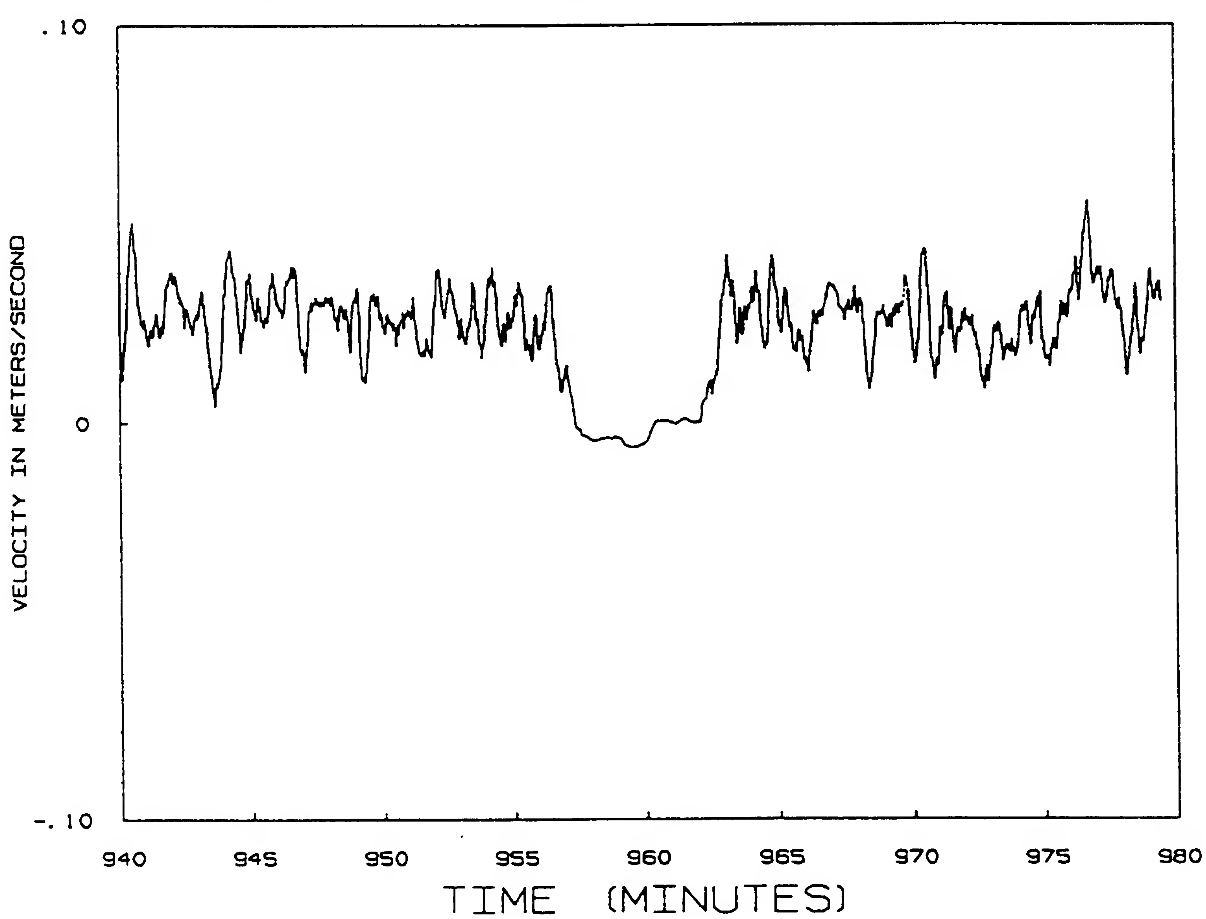


meter number	999	distance	375
tow name	jeff boat	start−time	1540
configuration	3x5	end−time	1620
draft	9.0	mean =	0.38
speed	4.2 mph	vmax = 0.65	tmax = 960.
direction	upstream	vmin = 0.30	tmin = 968.



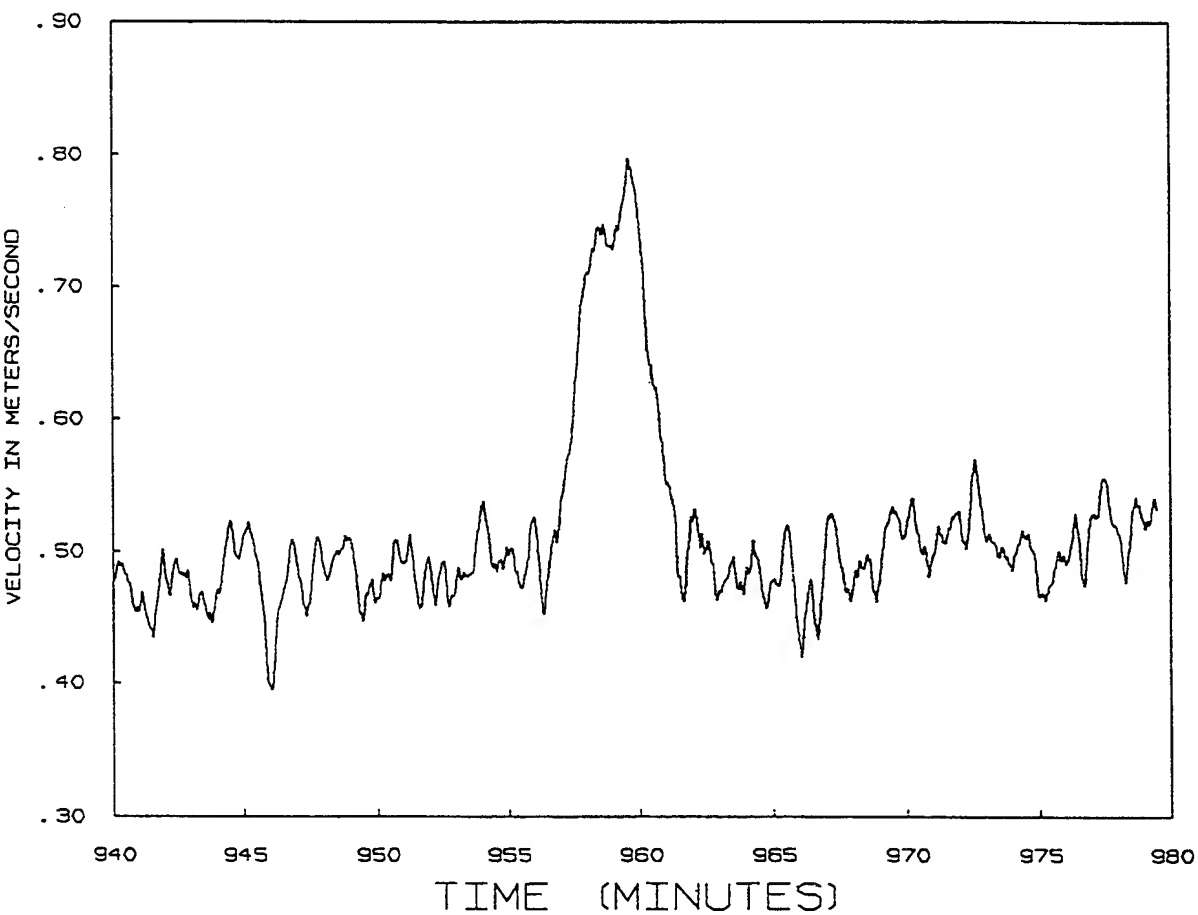
meter number	999	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	mean =	0.03
speed	4.2 mph	vmax =	0.06 tmax = 977.
direction	upstream	vmin =	-0.01 tmin = 960.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



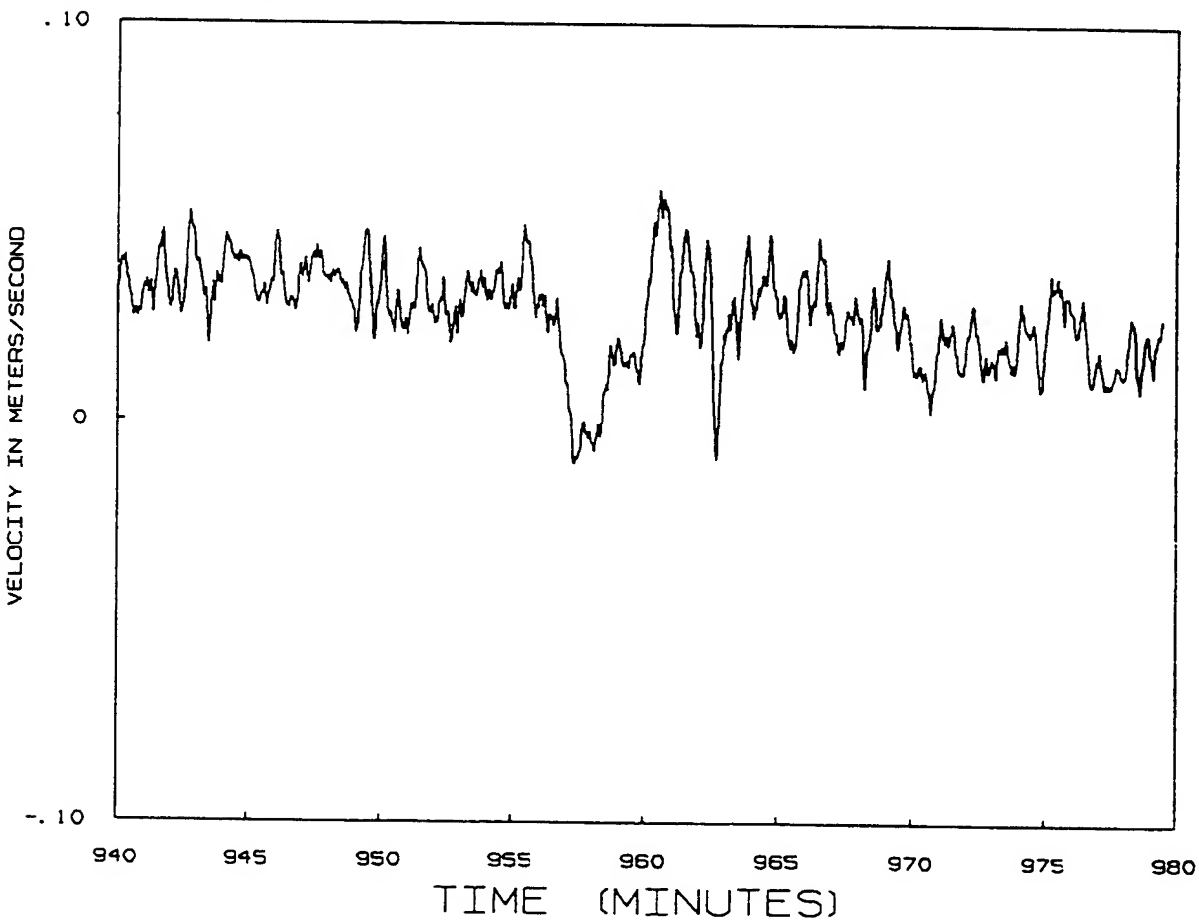
meter number	1000	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	mean =	0.48
speed	4.2 mph	vmax = 0.80	tmax = 960.
direction	upstream	vmin = 0.39	tmin = 946.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

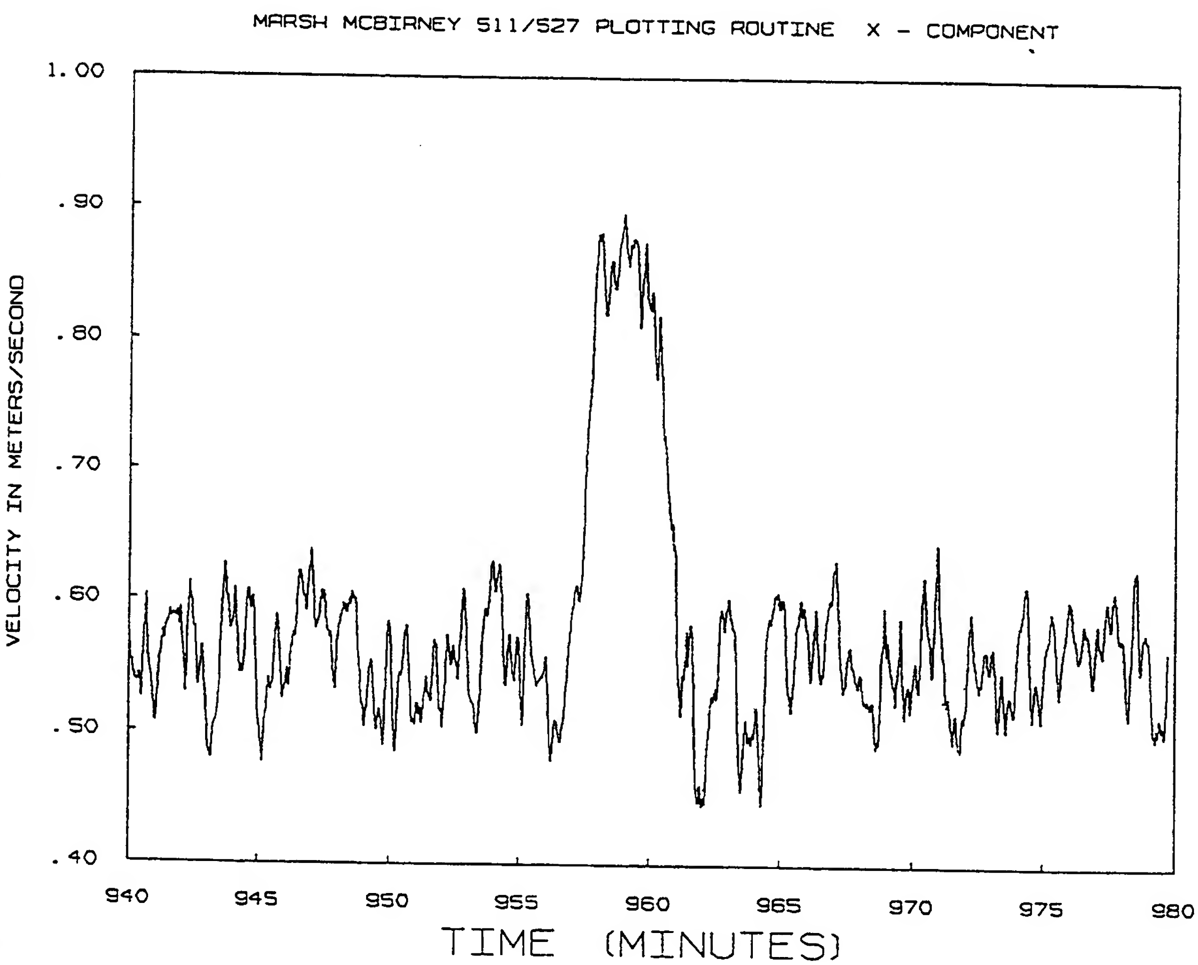


meter number	1000	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	mean =	0.04
speed	4.2 mph	vmax = 0.06	tmax = 961.
direction	upstream	vmin = -0.01	tmin = 957.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

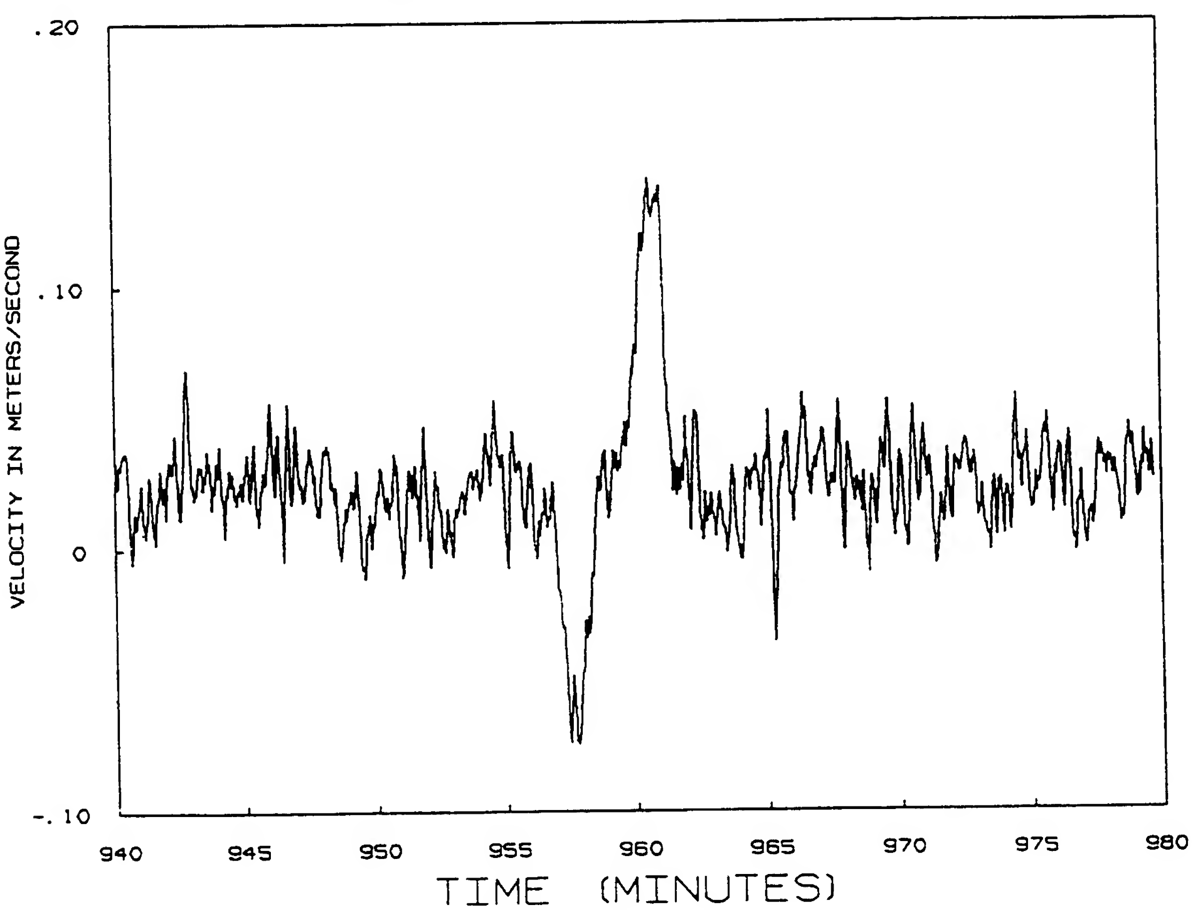


meter number	B-332	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean =	0.56
draft	9.0	vmax =	0.00 tmax = 959.
speed	4.2 mph	vmin =	0.00 tmin = 962.
direction	upstream		
distance	375		

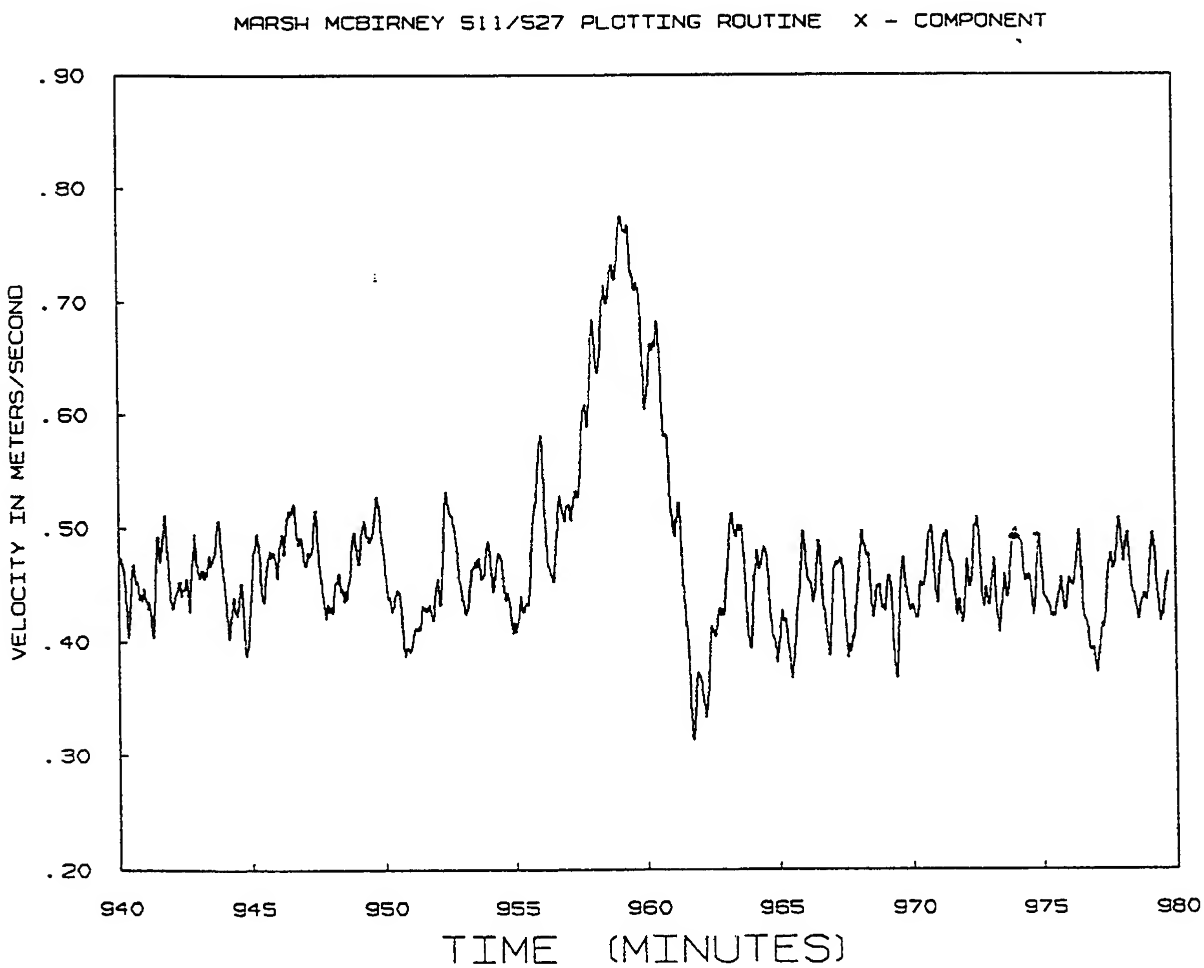


meter number	B-332	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean =	0.02
draft	9.0	vmax = 0.00	tmax = 961.
speed	4.2 mph	vmin = 0.00	tmin = 958.
direction	upstream		
distance	375		

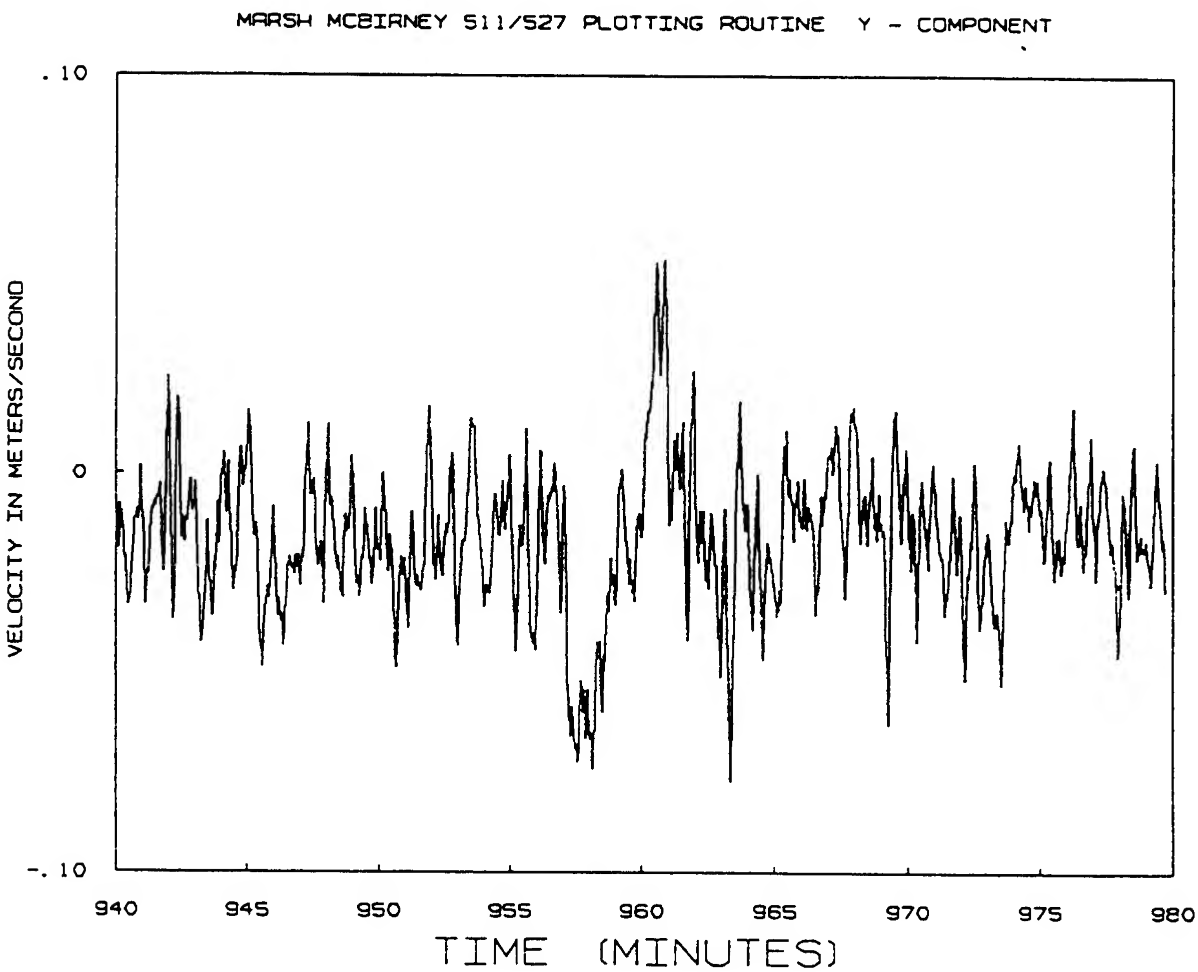
MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



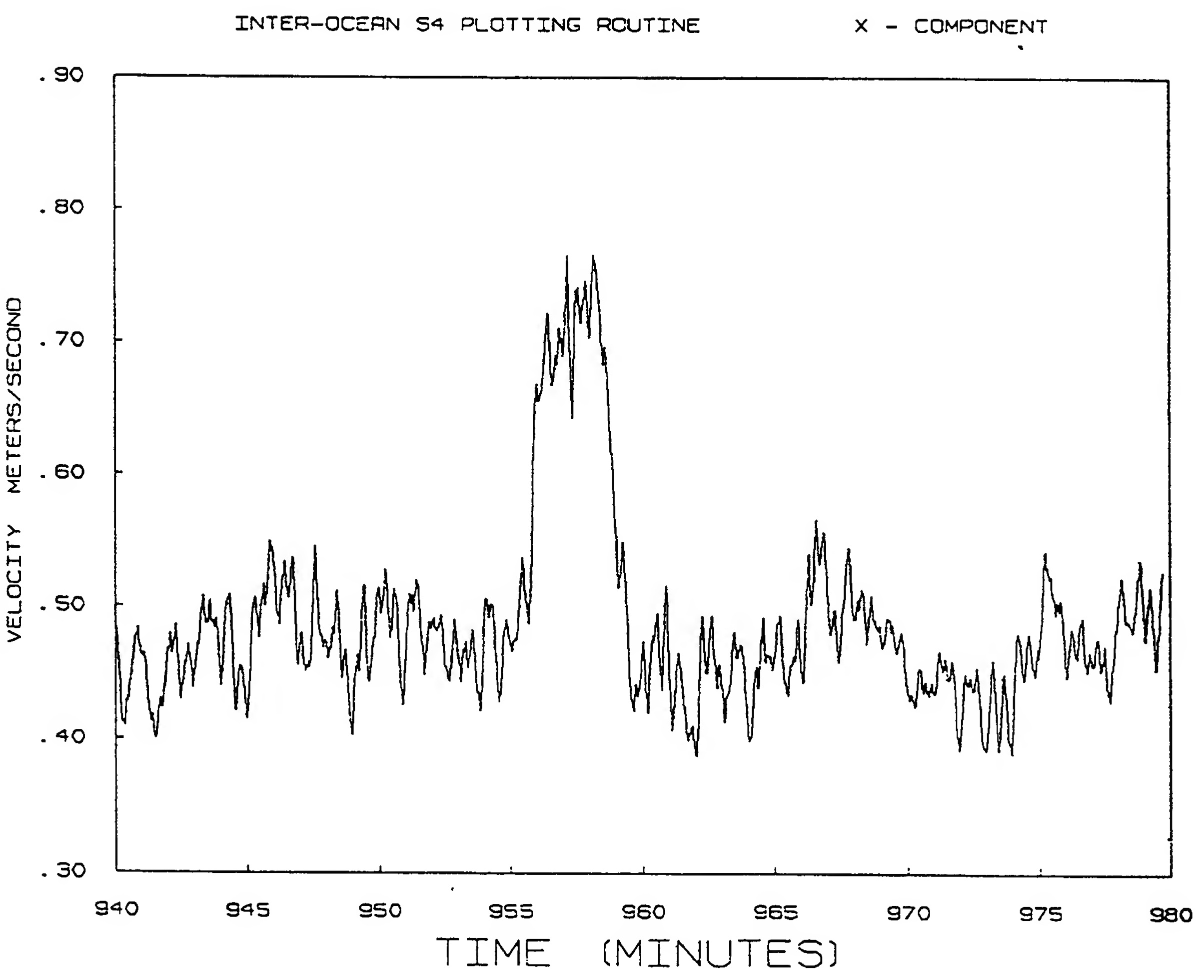
meter number	B-642	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean =	0.46
draft	9.0	vmax =	0.00 tmax = 959.
speed	4.2 mph	vmin =	0.00 tmin = 962.
direction	upstream		
distance	375		



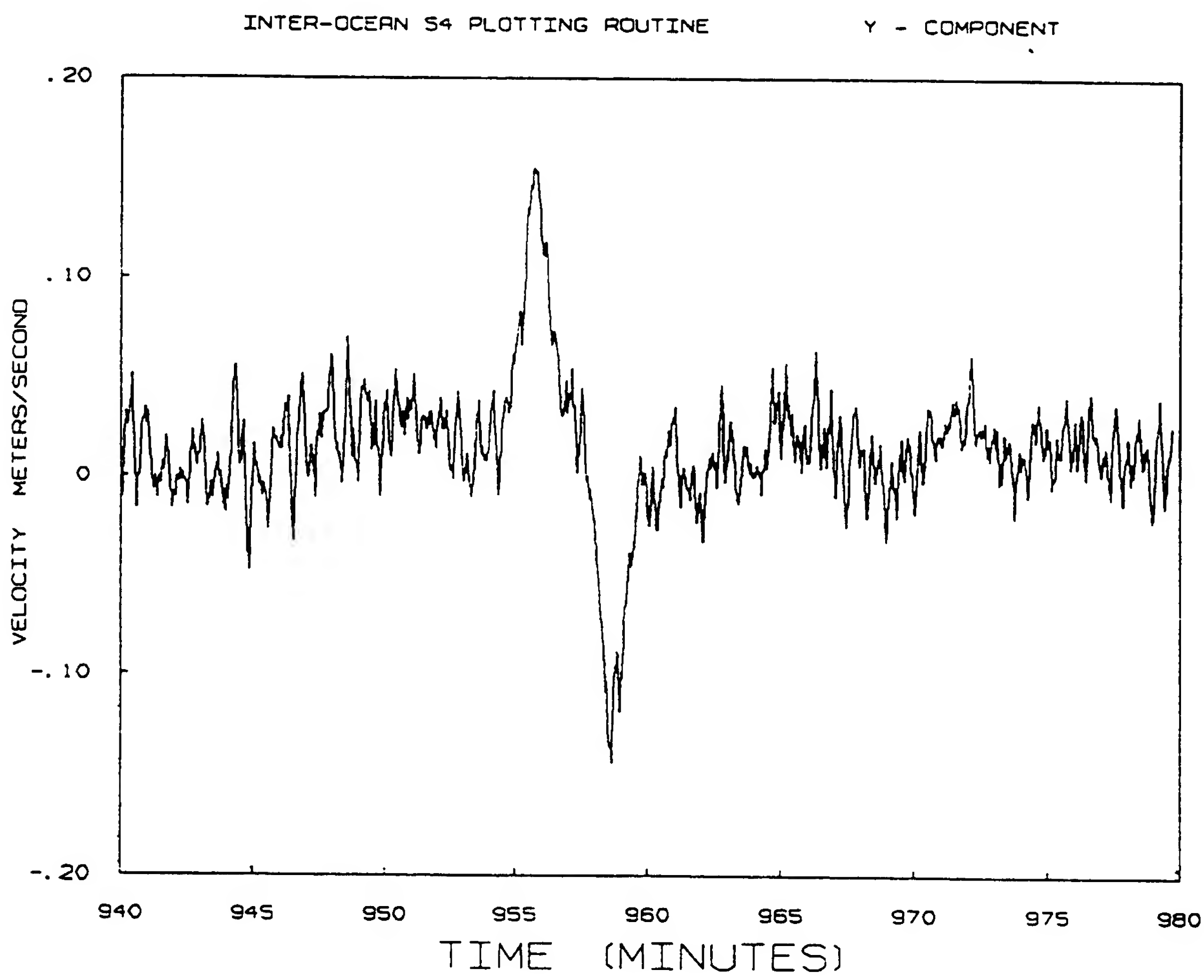
meter number	B-642	start-time	1540
tow name	jeff boat	end-time	1620
configuration	3x5	mean = -0.02	
draft	9.0	vmax = 0.00	tmax = 961.
speed	4.2 mph	vmin = 0.00	tmin = 963.
direction	upstream		
distance	375		



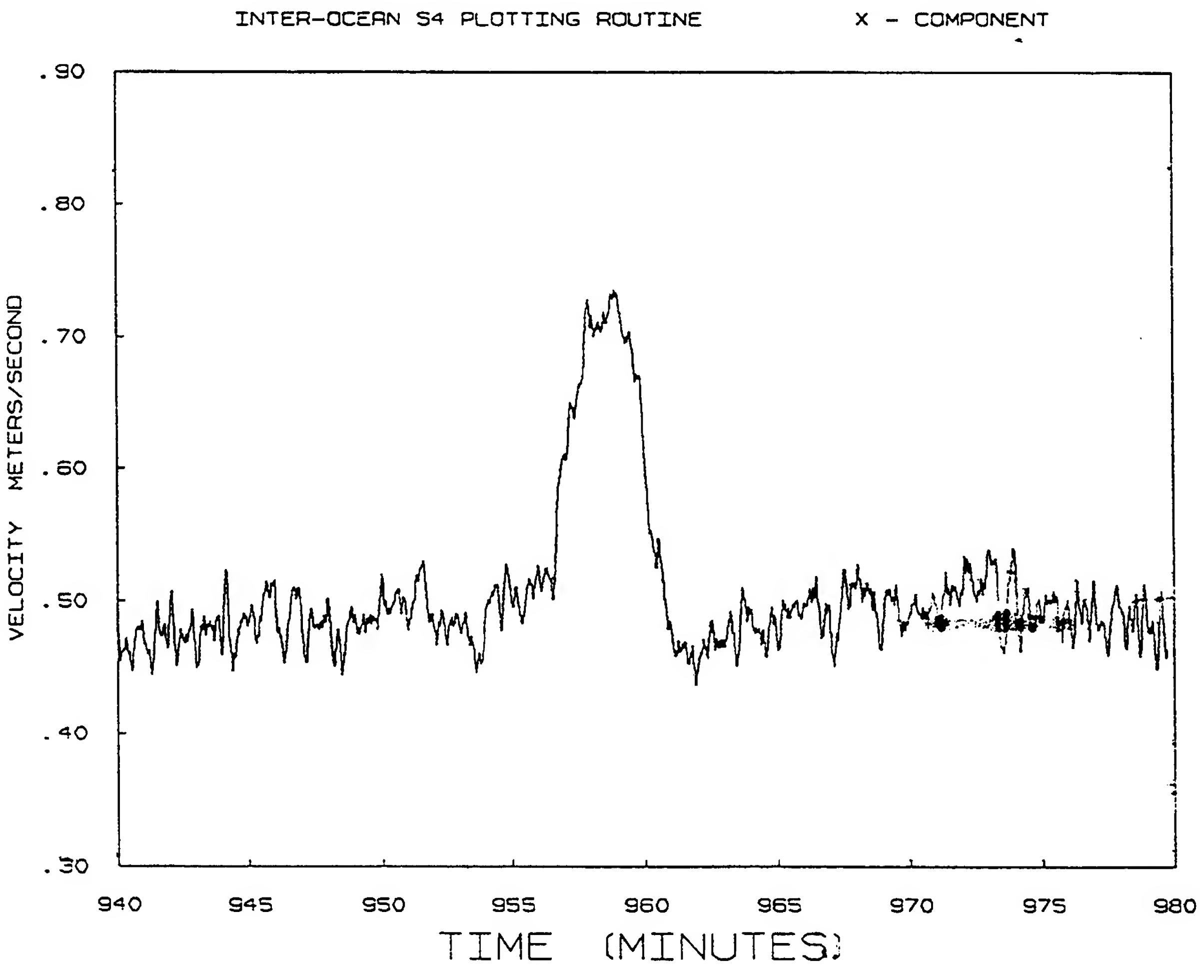
meter number	040	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	MEAN = 0.47	
speed	4.2 mph	VMAX = 0.77	TMAX = 958.
direction	upstream	VMIN = 0.39	TMIN = 962.



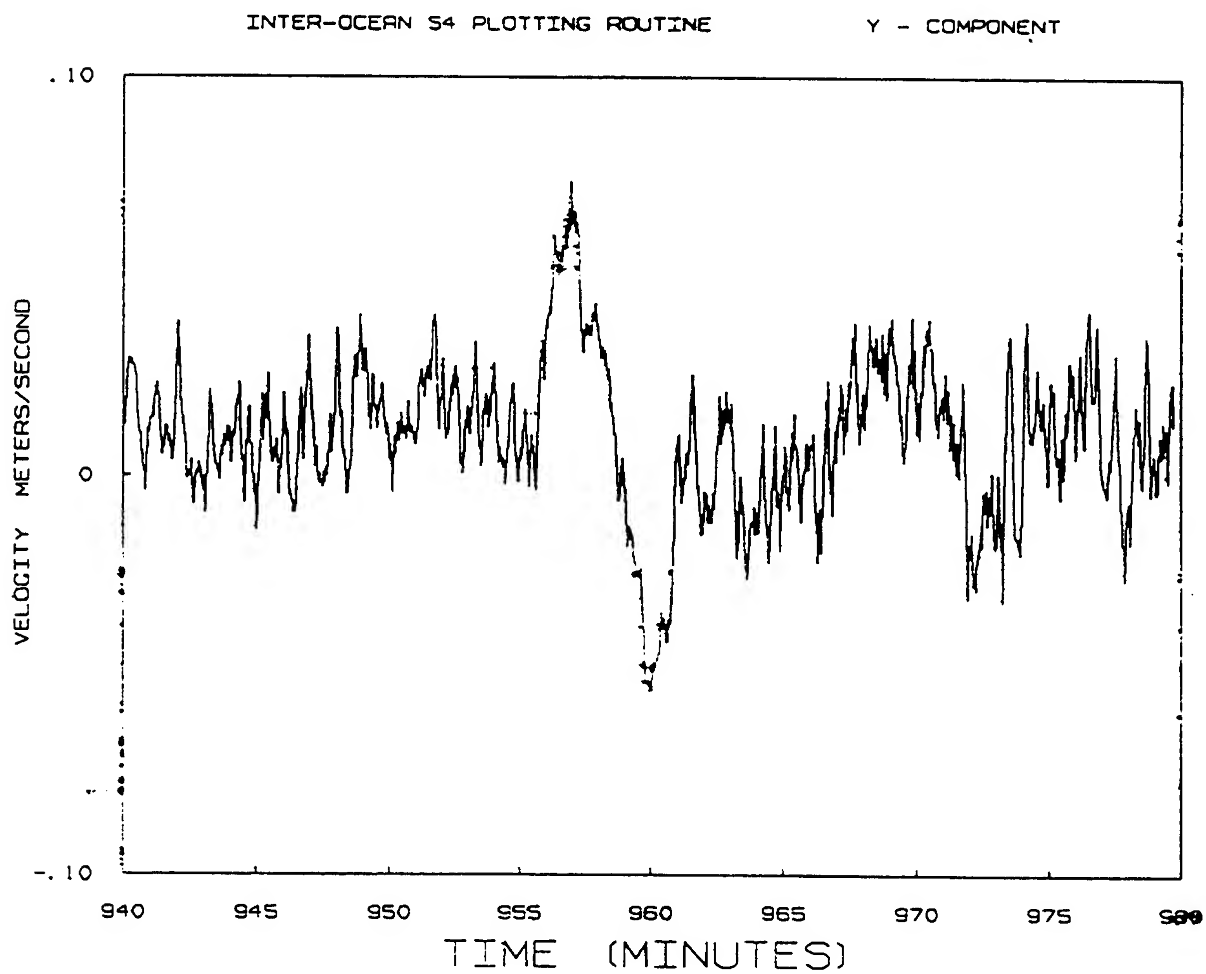
meter number	040	distance	375
tow name	jeff boat	start−time	1540
configuration	3x5	end−time	1620
draft	9.0	MEAN = 0.01	
speed	4.2 mph	VMAX = 0.16	TMAX = 956.
direction	upstream	VMIN = −0.14	TMIN = 959.



meter number	071	distance	375
tow name	jeff boat	start-time	1540
configuration	3x5	end-time	1620
draft	9.0	MEAN = 0.48	
speed	4.2 mph	VMAX = 0.74	TMAX = 959.
direction	upstream	VMIN = 0.44	TMIN = 962.



meter number	071	distance	375			
tow name	jeff boat	start-time	1540			
configuration	3x5	end-time	1620			
draft	9.0	MEAN =	0.01			
speed	4.2 mph	VMAX =	0.07	TMAX	=	957.
direction	upstream	VMIN =	-0.05	TMIN	=	960.



XX-5. Velocity fluctuations measured by two-dimensional current meters for barge *American Beauty* at Clarks Ferry, trip 1

American Beauty (1) (5/20/91)

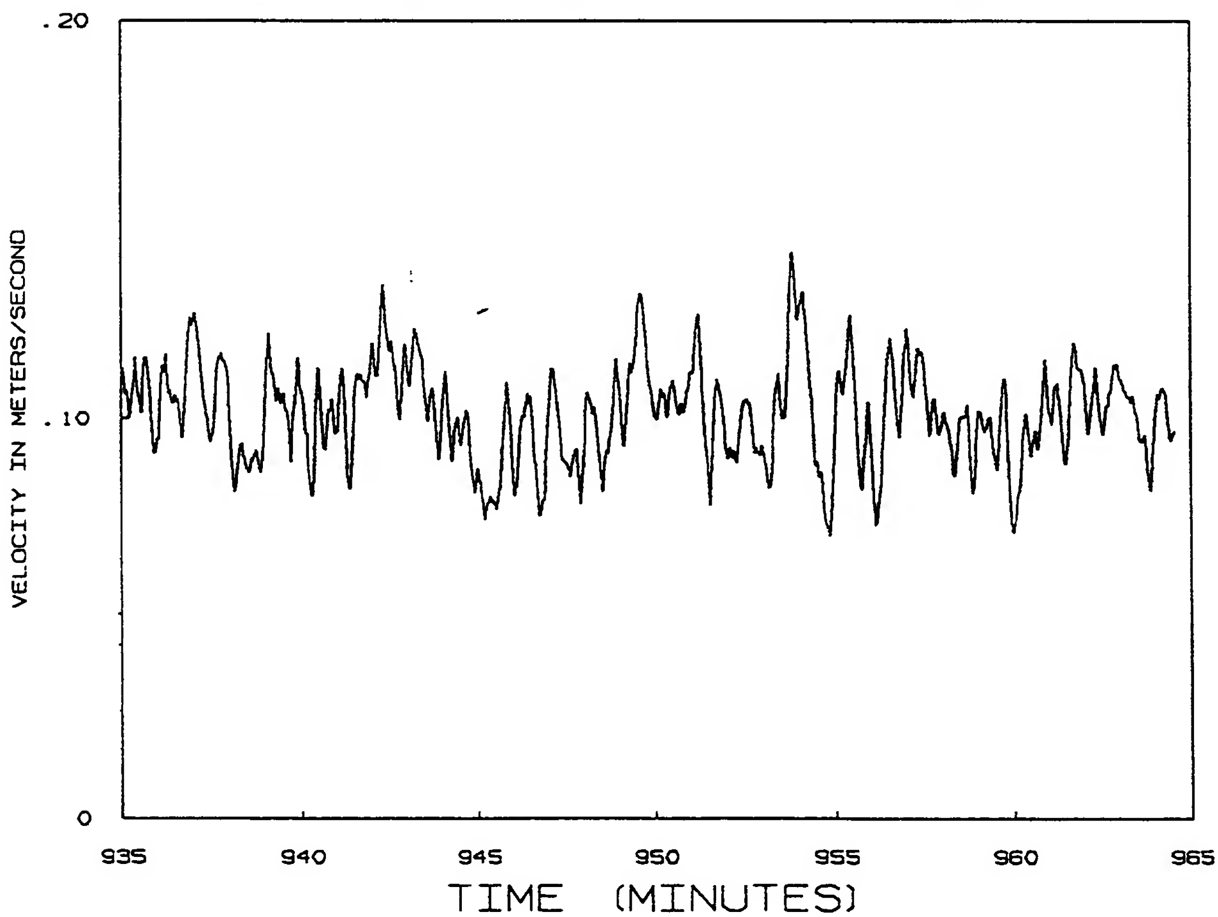
Status of Electromagnetic Current Meters:

1001 (MMB511) √	1330 (MMB511) √	1331 (MMB511) √	998 (MMB511) √	999 (MMB511) √	1000 (MMB511) √
151 (S4) *	834 (S4) √	040 (S4) √	832 (S4) √	071 (S4) *	
332 (MMB527) √	642 (MMB527) √				

Note: √ : Working
* : Not working
- : Not available

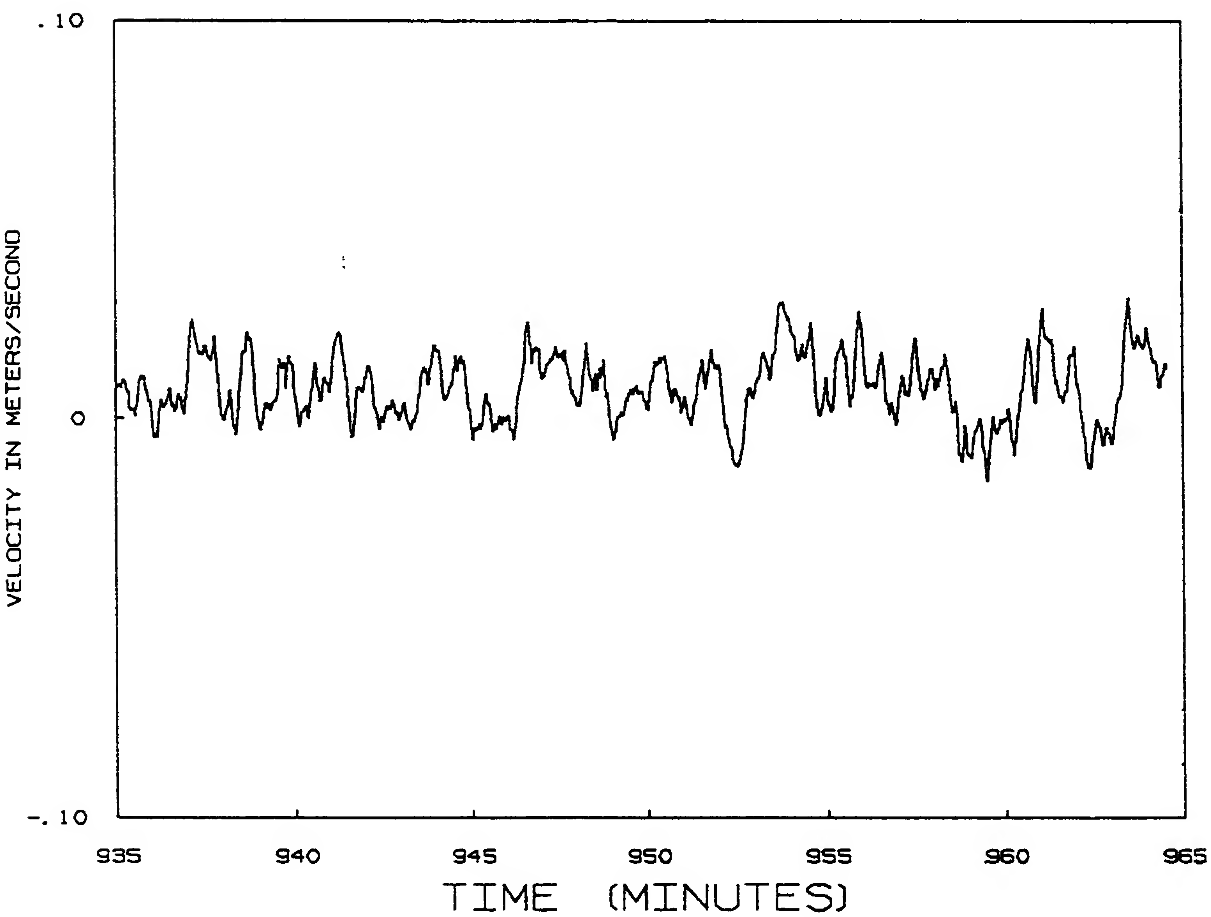
meter number	1001	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean = 0.10	
speed	7.1 mph	vmax = 0.14	tmax = 954.
direction	upstream	vmin = 0.07	tmin = 955.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



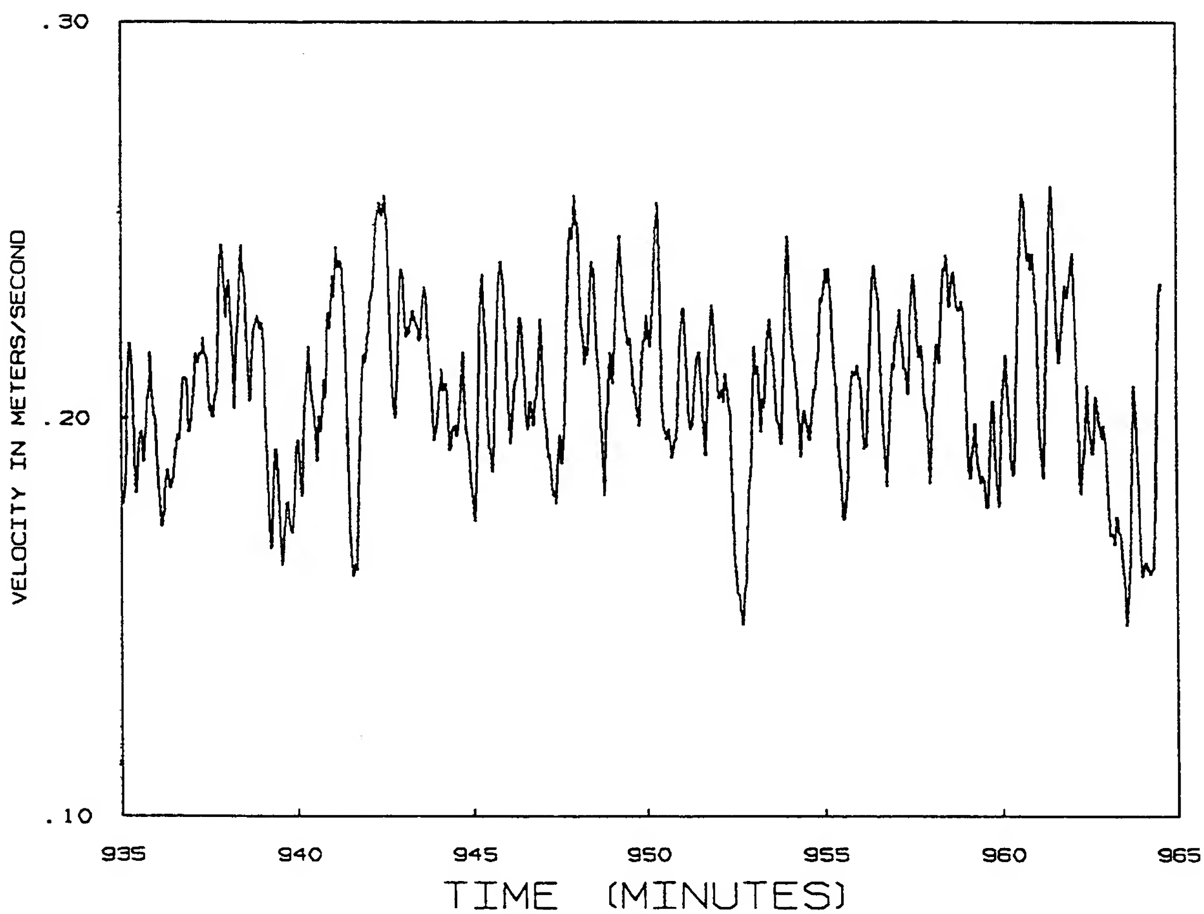
meter number	1001	distance	275
tow name	American	start–time	1535
configuration	3x5	end–time	1605
draft	2.0	mean =	0.01
speed	7.1 mph	vmax =	0.03 tmax = 963.
direction	upstream	vmin =	–0.02 tmin = 960.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

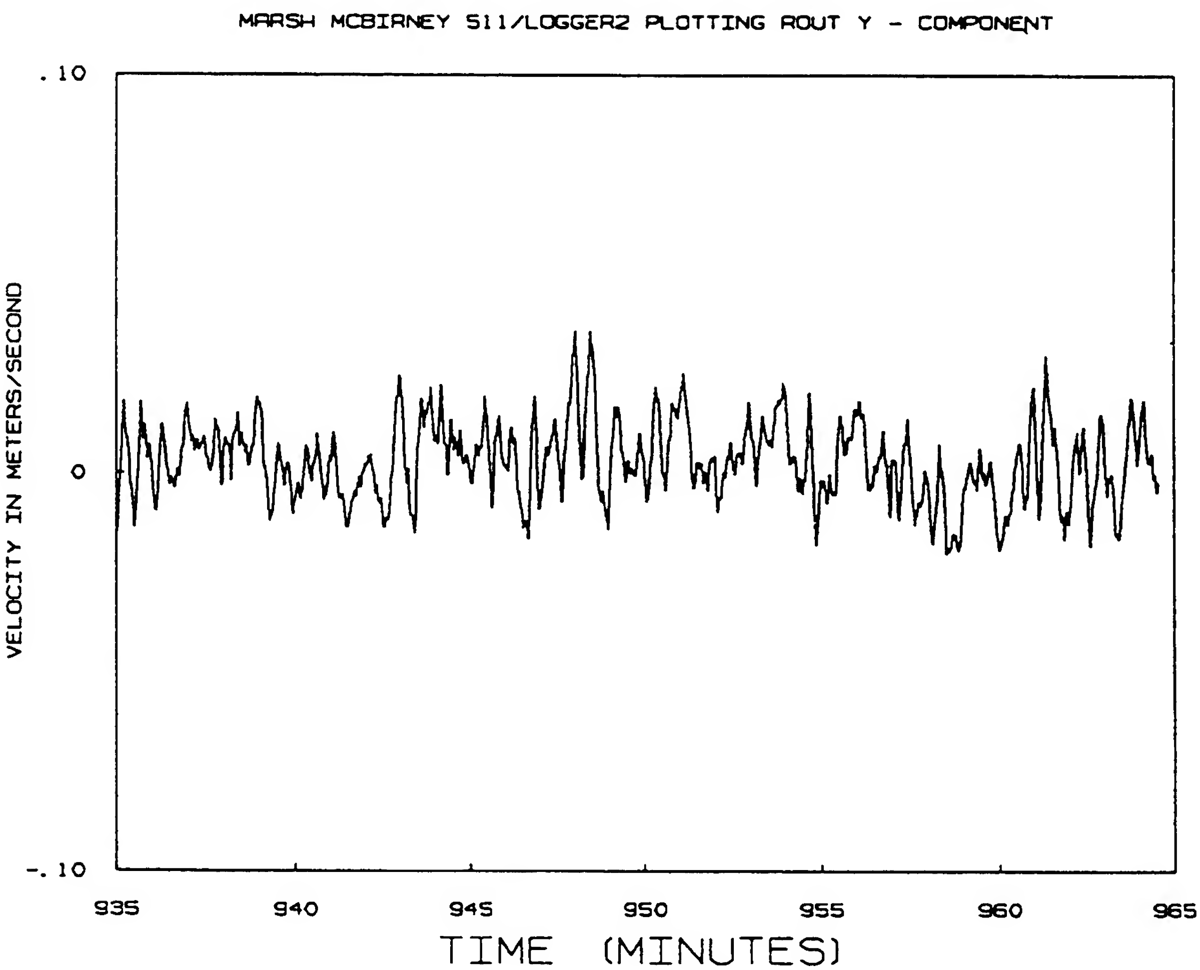


meter number	1130	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.21
speed	7.1 mph	vmax =	0.26 tmax = 961.
direction	upstream	vmin =	0.15 tmin = 964.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

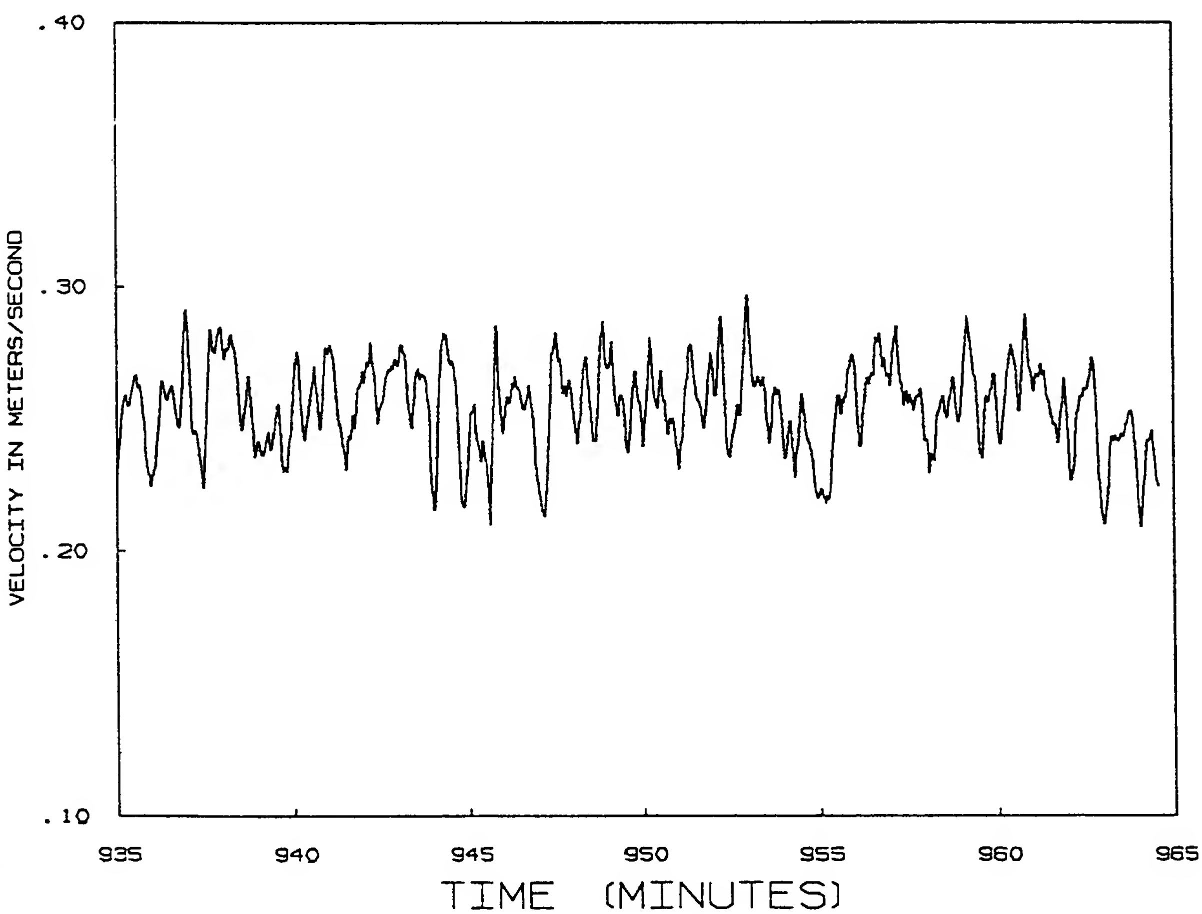


meter number	1130	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.00
speed	7.1 mph	vmax = 0.04	tmax = 948.
direction	upstream	vmin = -0.02	tmin = 959.

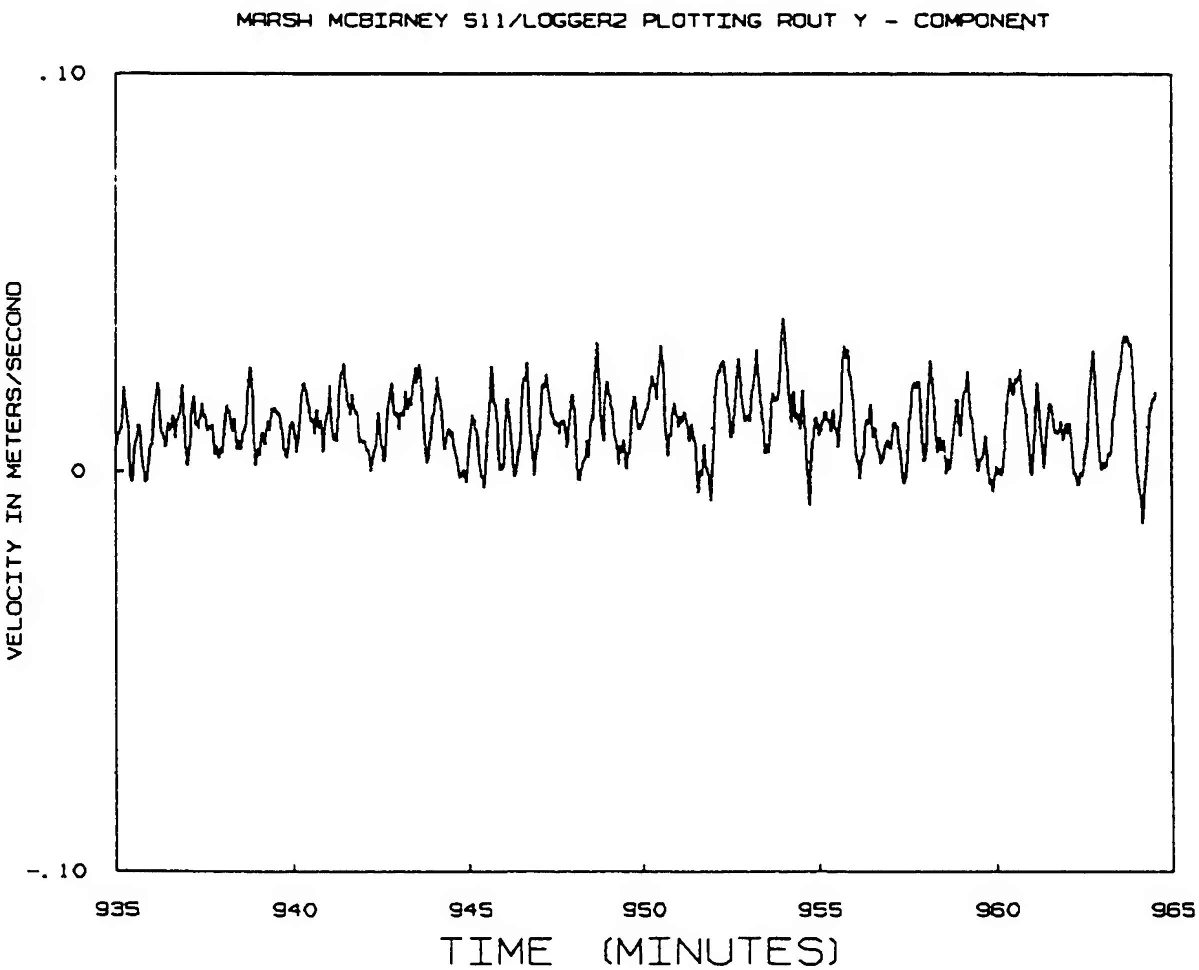


meter number	1131	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.26
speed	7.1 mph	vmax =	0.30 tmax = 953.
direction	upstream	vmin =	0.21 tmin = 964.

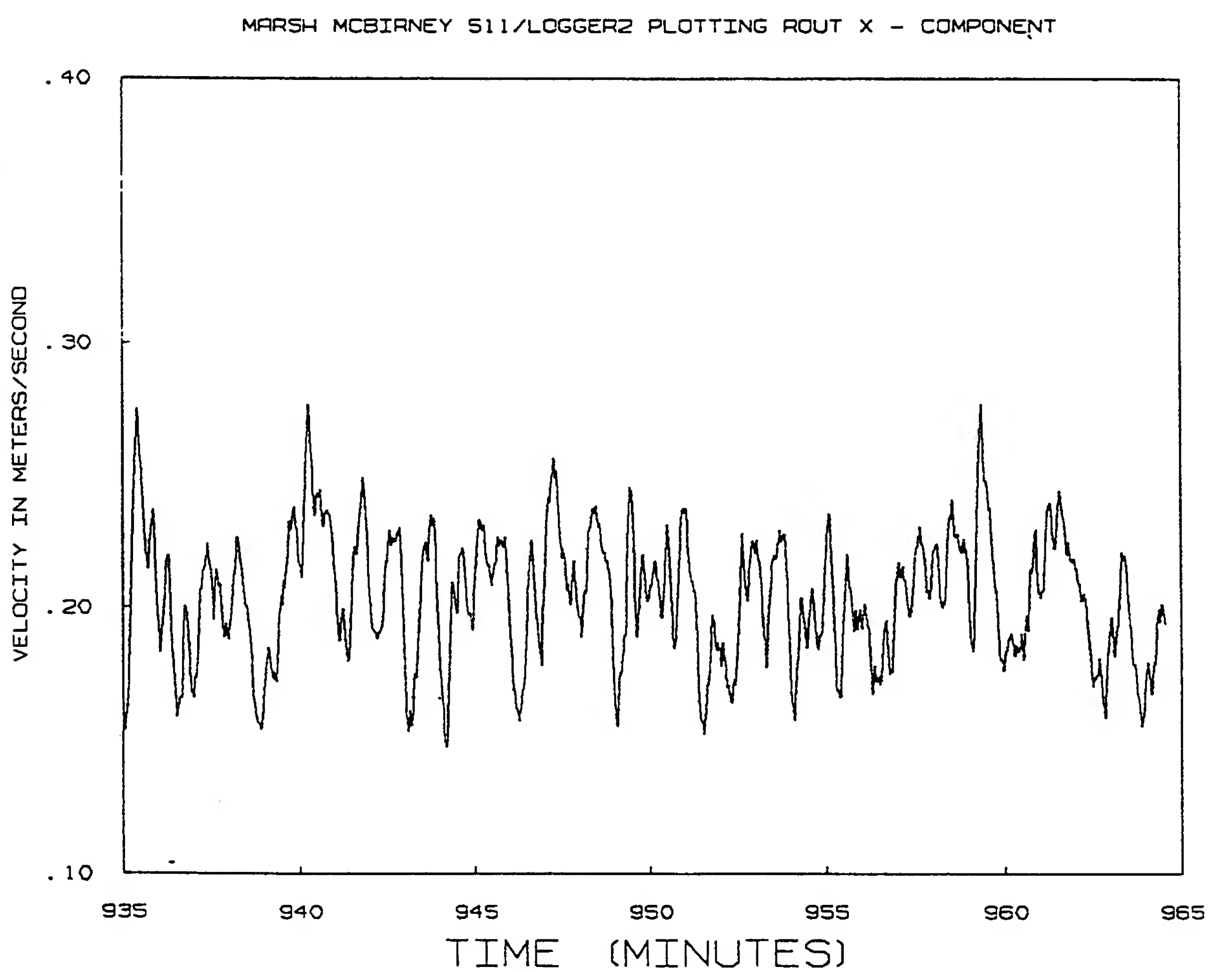
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



meter number	1131	distance	275		
tow name	American	start-time	1535		
configuration	3x5	end-time	1605		
draft	2.0	mean =	0.01		
speed	7.1 mph	vmax =	0.04	tmax =	954.
direction	upstream	vmin =	-0.01	tmin =	964.

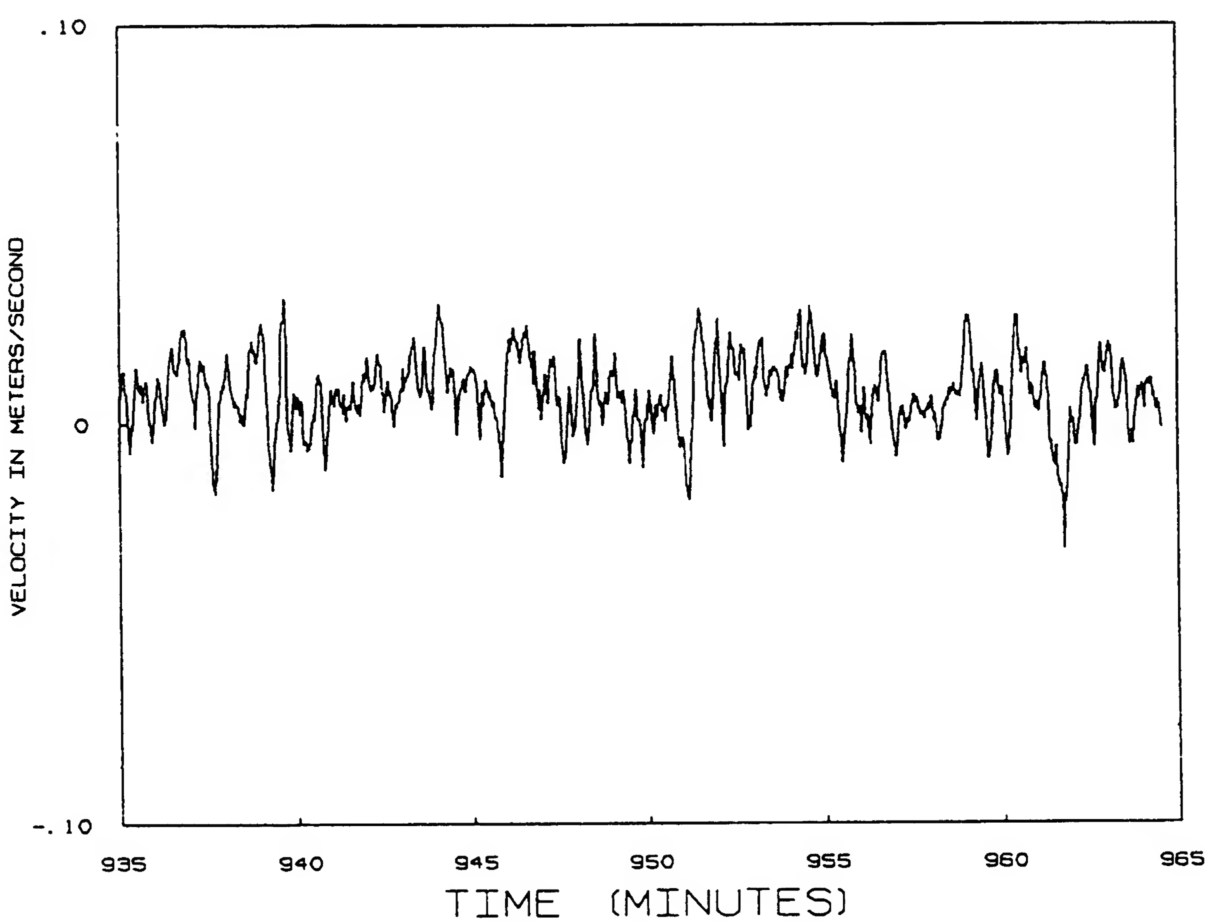


meter number	998	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.20
speed	7.1 mph	vmax =	0.28 tmax = 959.
direction	upstream	vmin =	0.15 tmin = 944.

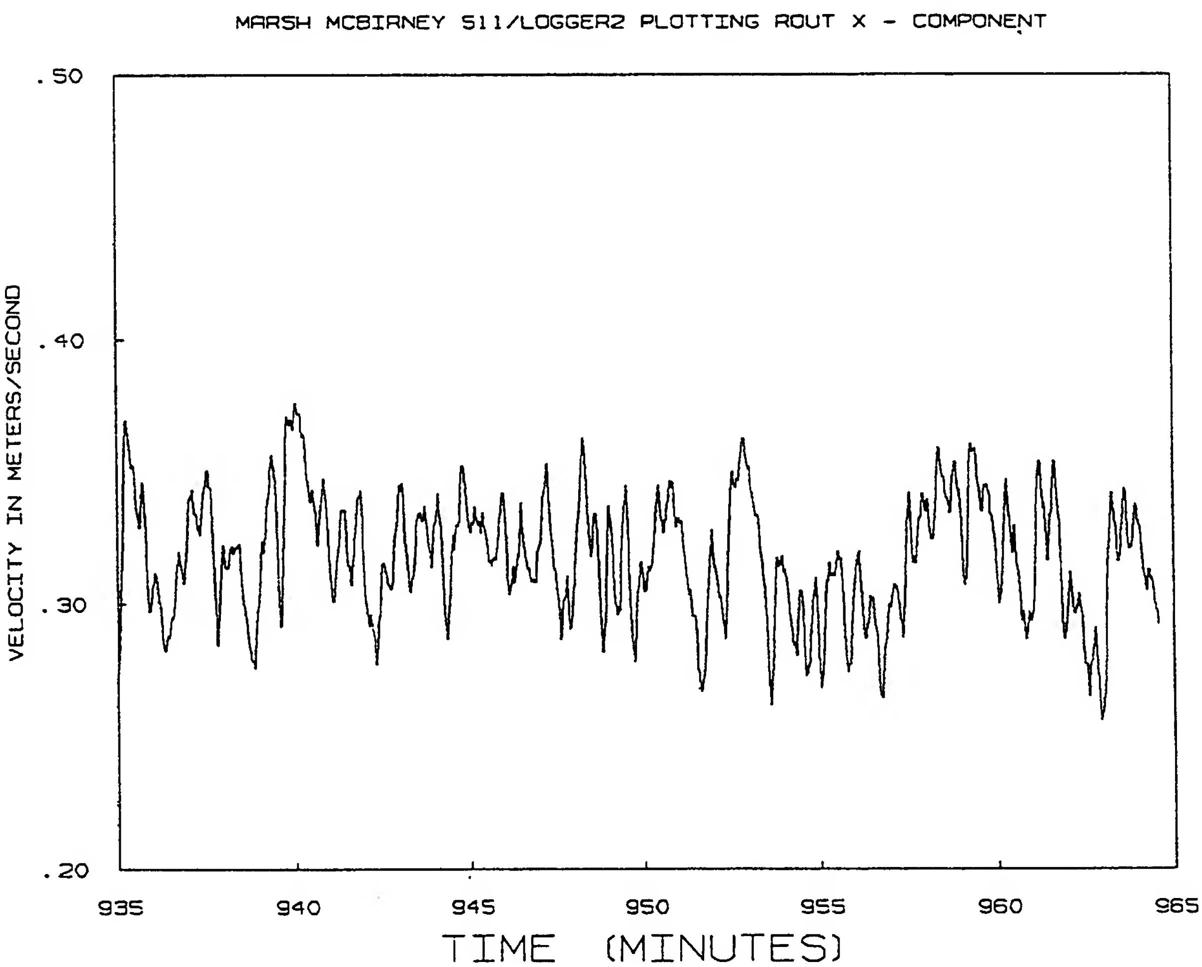


meter number	998	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.01
speed	7.1 mph	vmax =	0.03 tmax = 940.
direction	upstream	vmin =	-0.03 tmin = 962.

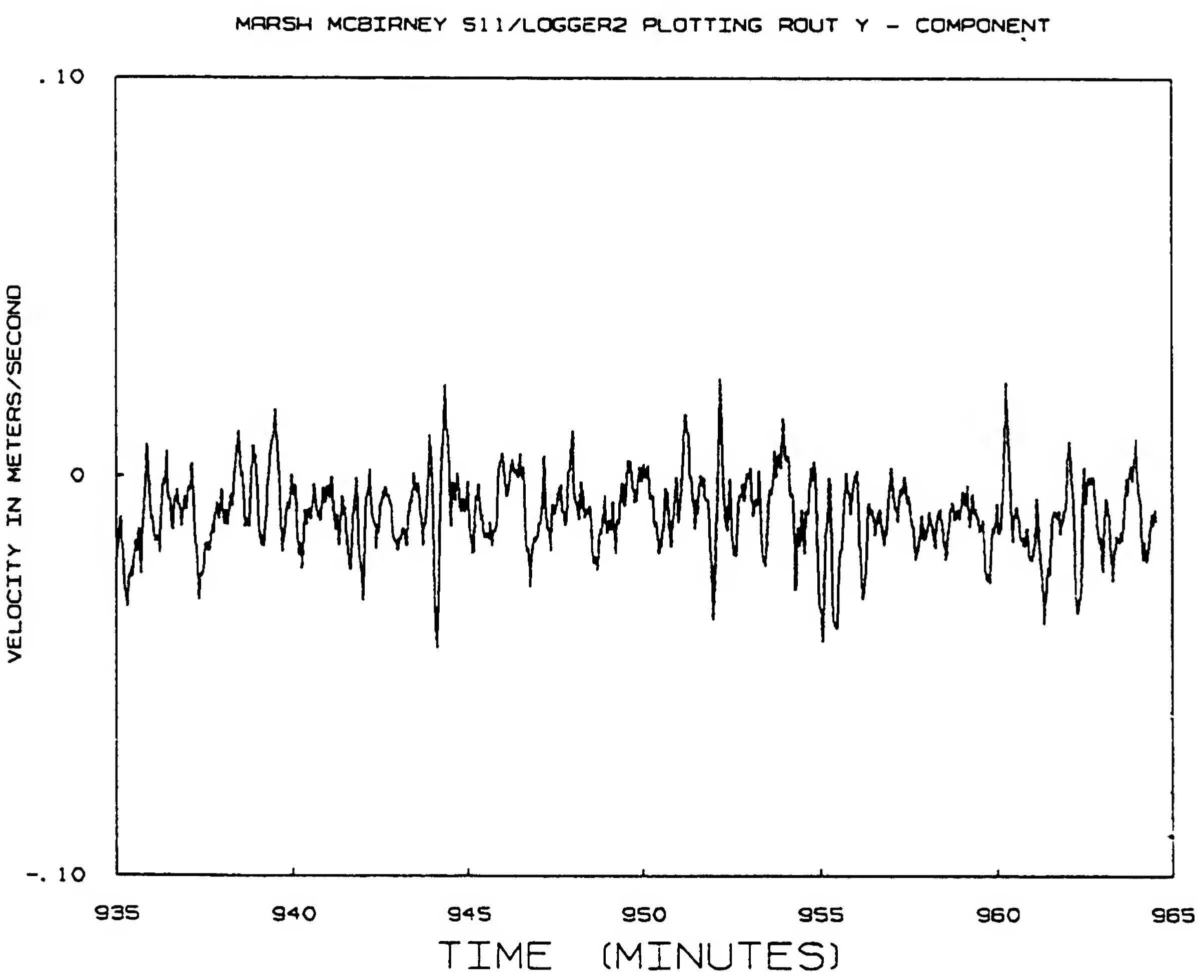
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



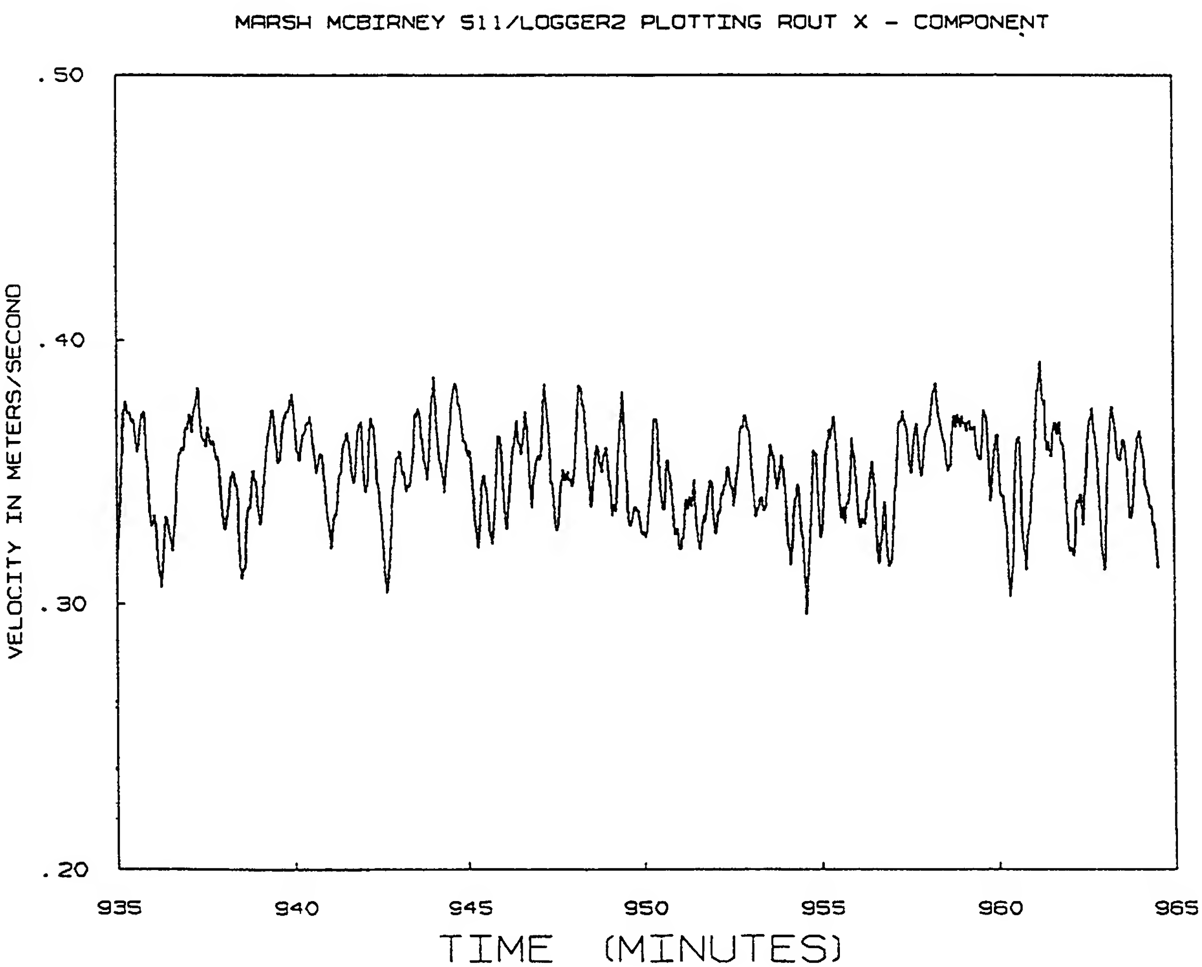
meter number	999	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	0.32
speed	7.1 mph	vmax =	0.38 tmax = 940.
direction	upstream	vmin =	0.26 tmin = 963.



meter number	999	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	-0.01
speed	7.1 mph	vmax =	0.02 tmax = 952.
direction	upstream	vmin =	-0.04 tmin = 944.

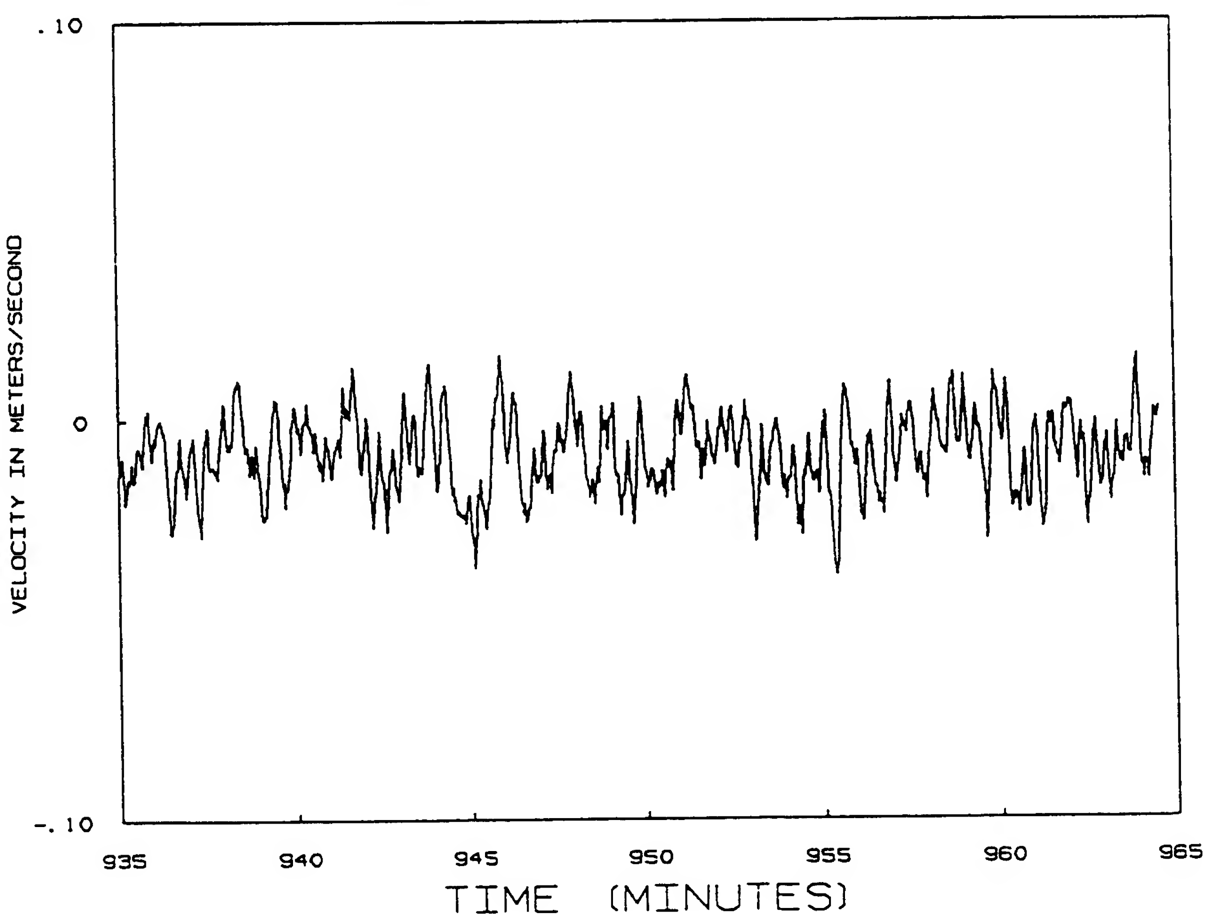


meter number	1000	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean = 0.35	
speed	7.1 mph	vmax = 0.39	tmax = 961.
direction	upstream	vmin = 0.30	tmin = 955.

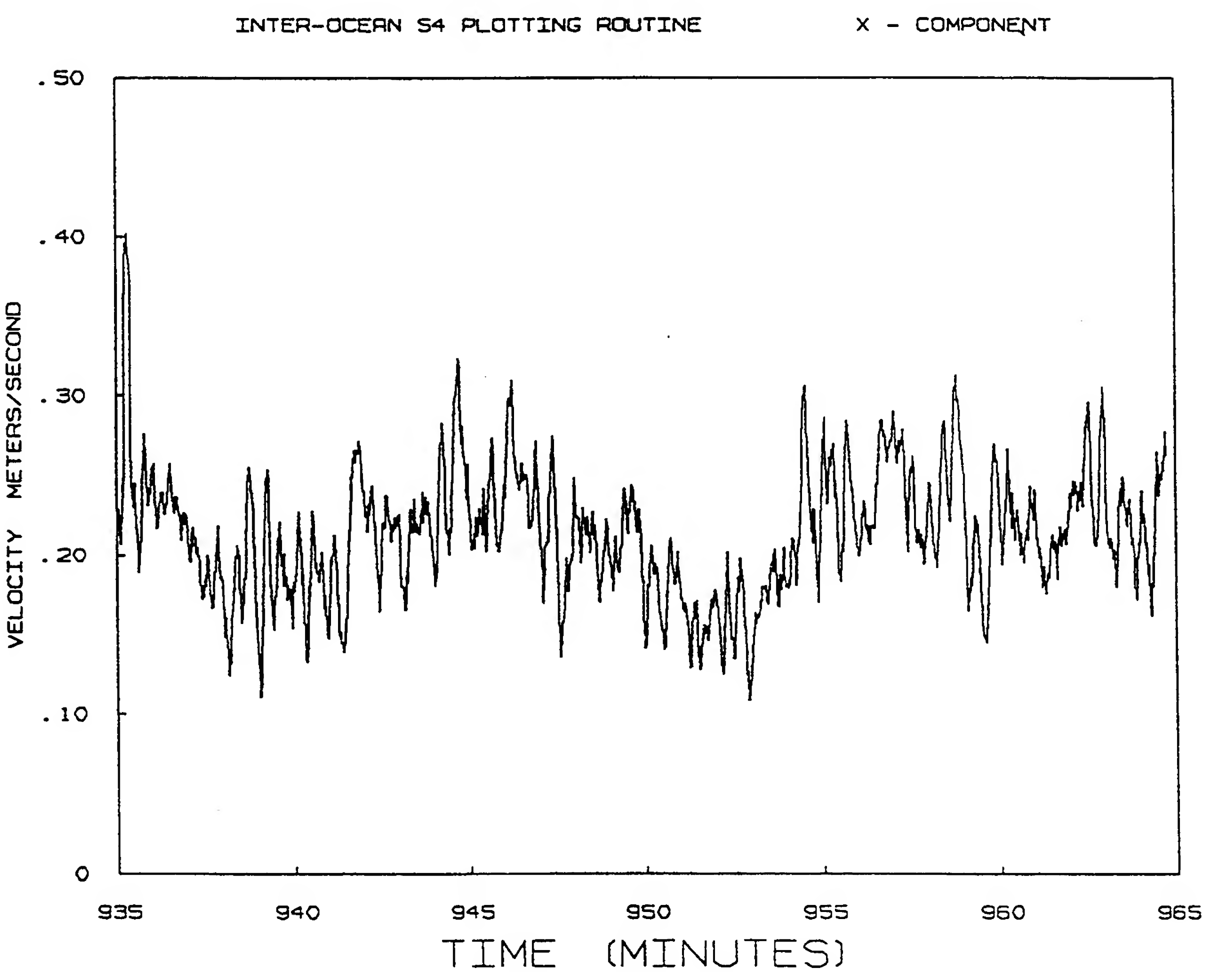


meter number	1000	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	mean =	-0.01
speed	7.1 mph	vmax = 0.02	tmax = 946.
direction	upstream	vmin = -0.04	tmin = 955.

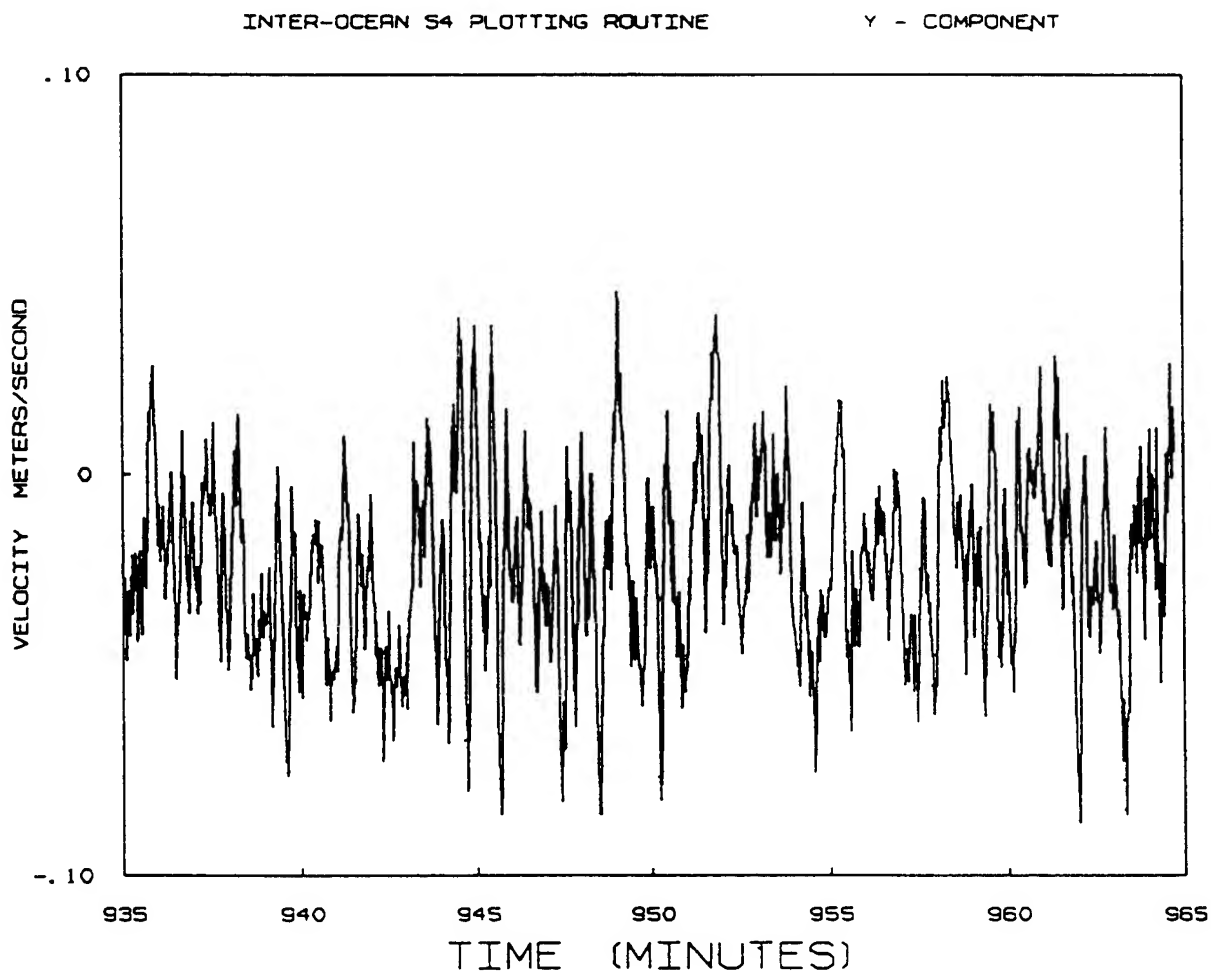
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



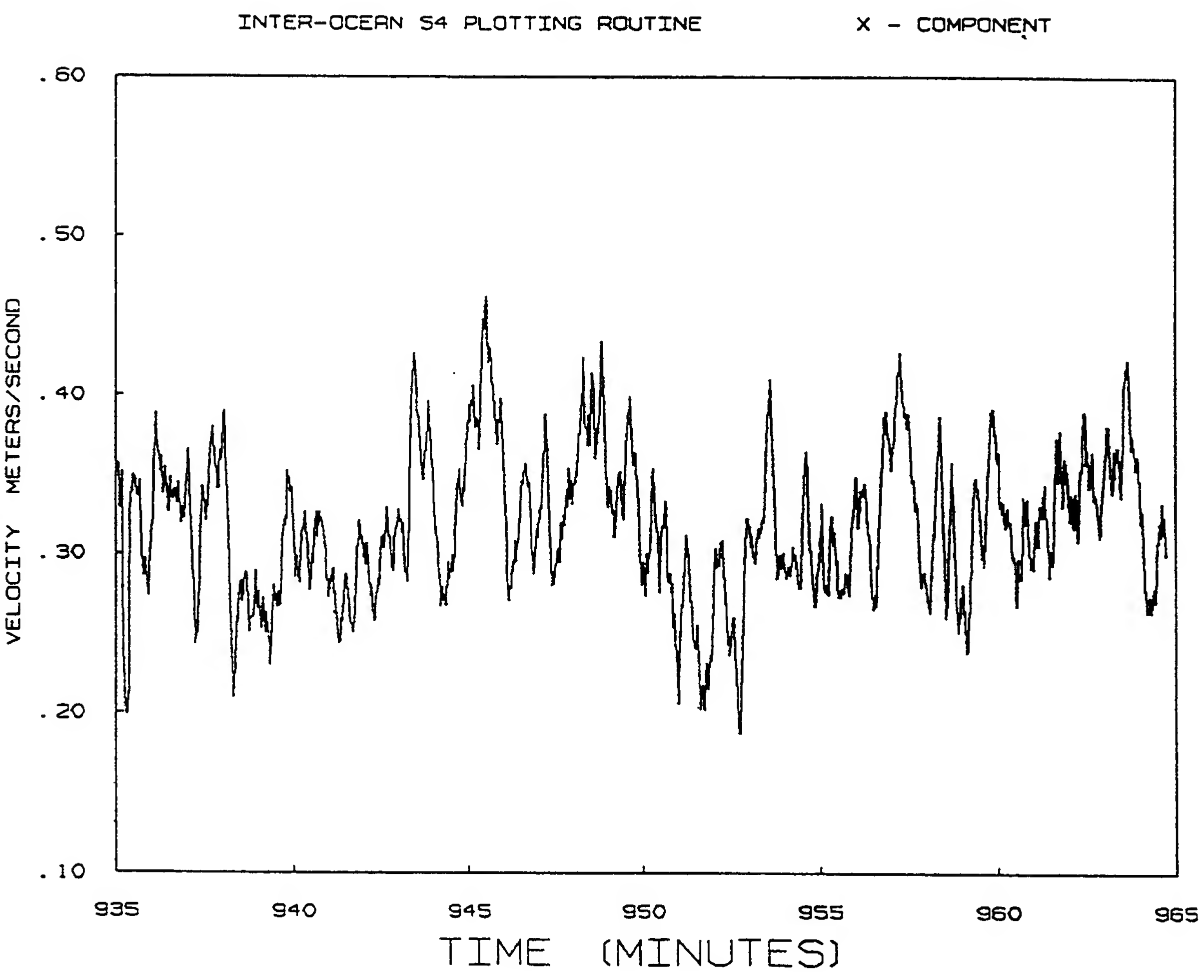
meter number	151	distance	275
tow name	American	start–time	1535
configuration	3x5	end–time	1605
draft	2.0	MEAN = 0.21	
speed	7.1 mph	VMAX = 0.40	TMAX = 935.
direction	upstream	VMIN = 0.11	TMIN = 953.



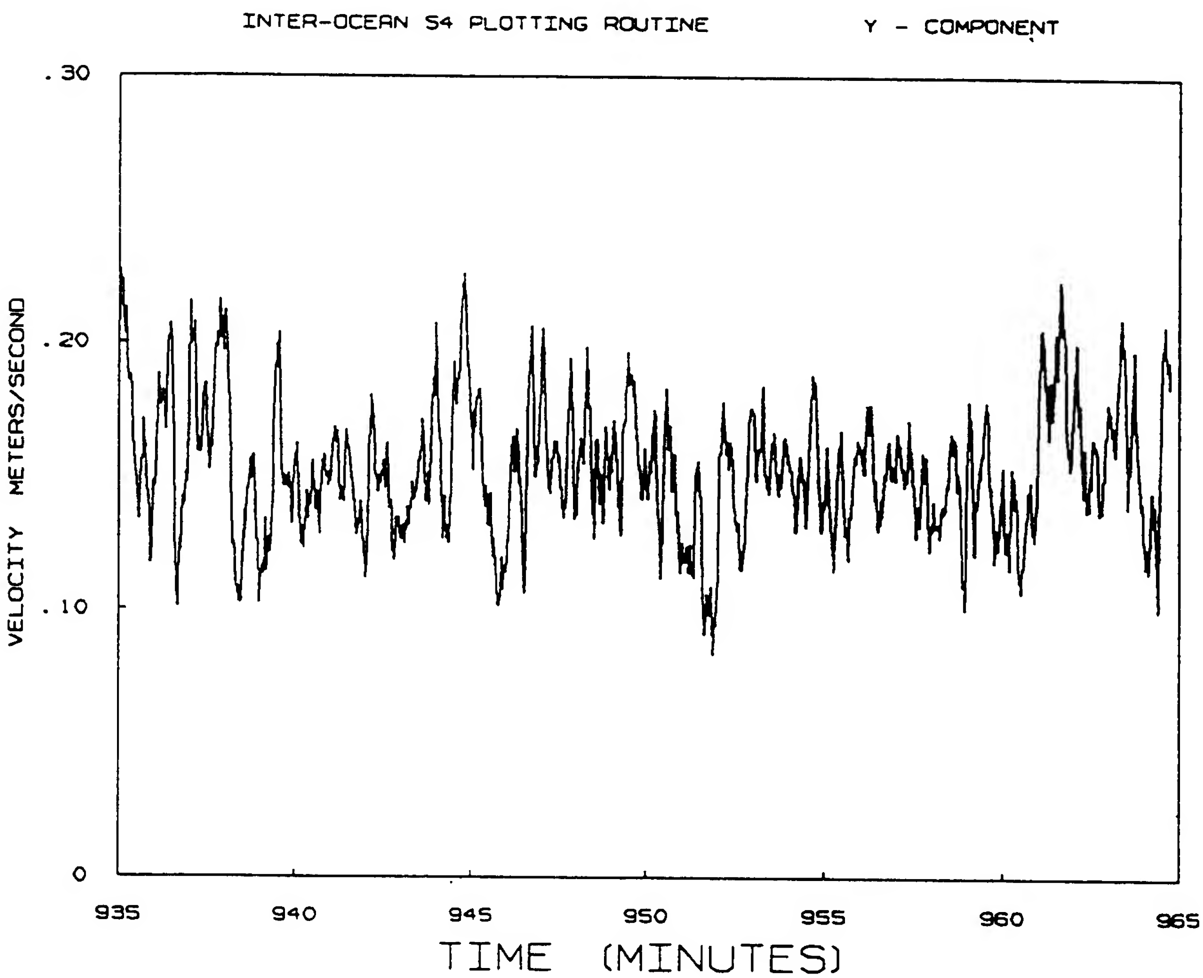
meter number	151	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	MEAN = −0.03	
speed	7.1 mph	VMAX = 0.05	TMAX = 949.
direction	upstream	VMIN = −0.09	TMIN = 962.



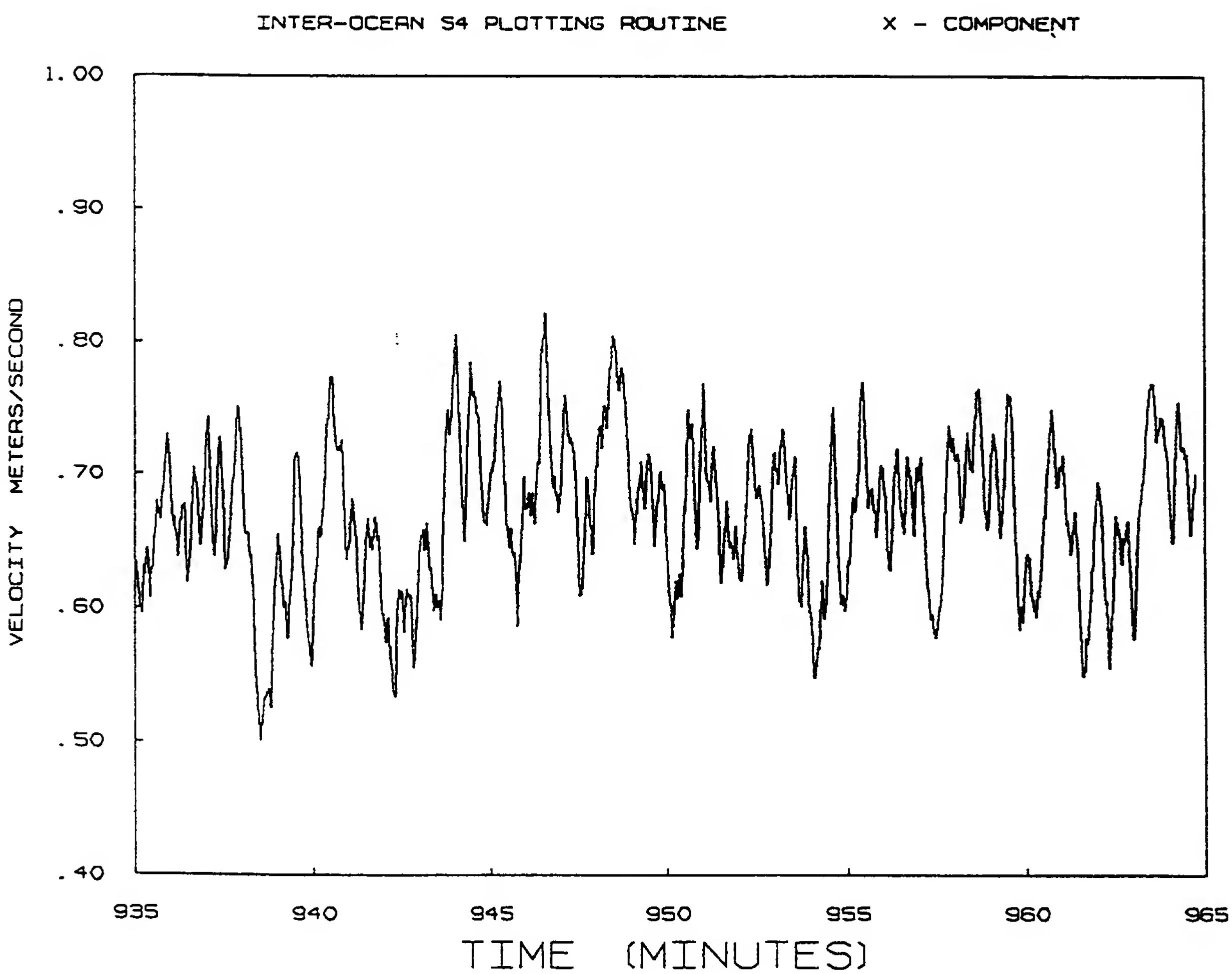
meter number	834	distance	275
tow name	American	start–time	1535
configuration	3x5	end–time	1605
draft	2.0	MEAN =	0.31
speed	7.1 mph	VMAX =	0.46 TMAX = 946.
direction	upstream	VMIN =	0.19 TMIN = 953.



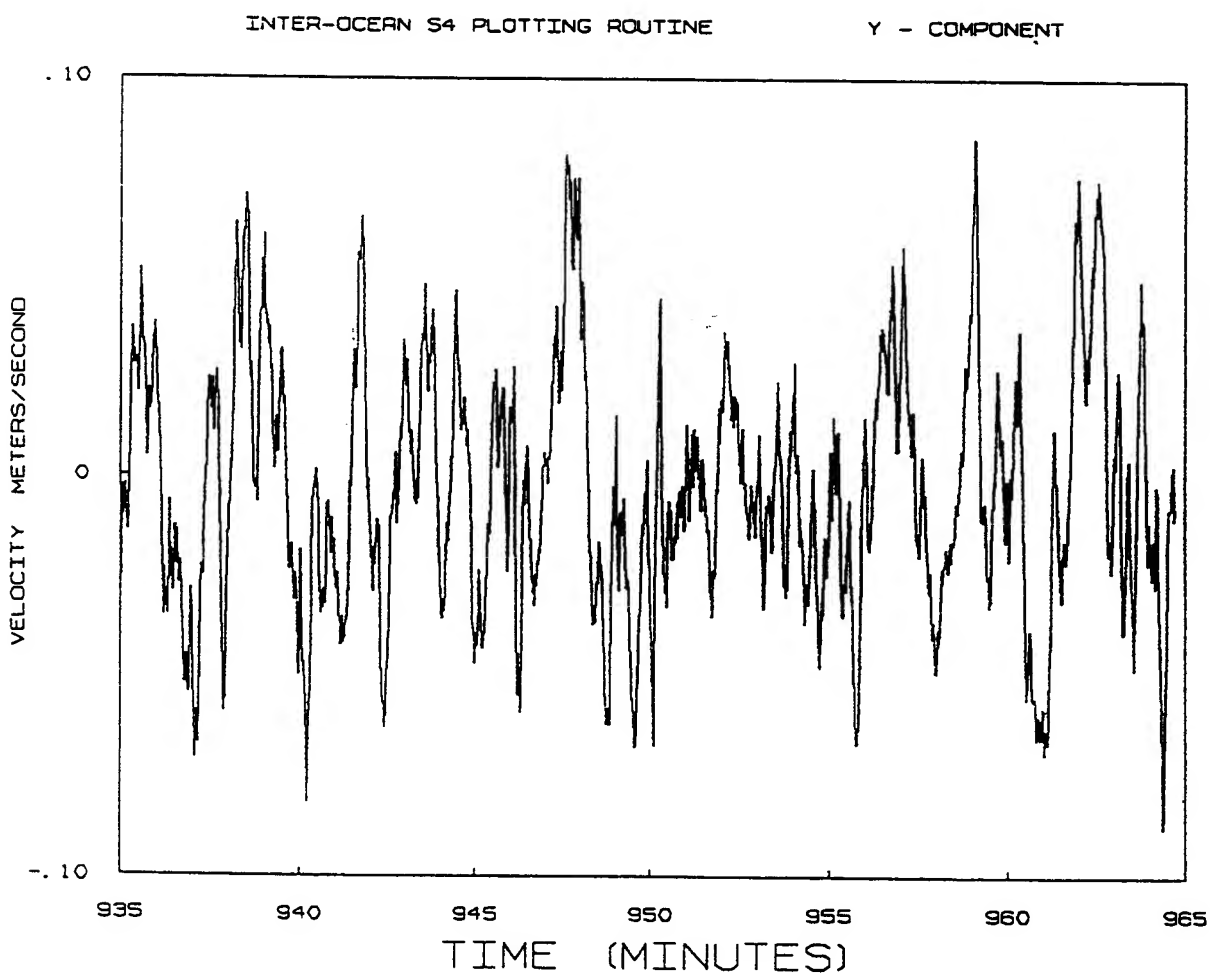
meter number	834	distance	275
tow name	American	start–time	1535
configuration	3x5	end–time	1605
draft	2.0	MEAN = 0.16	
speed	7.1 mph	VMAX = 0.23	TMAX = 935.
direction	upstream	VMIN = 0.08	TMIN = 952.



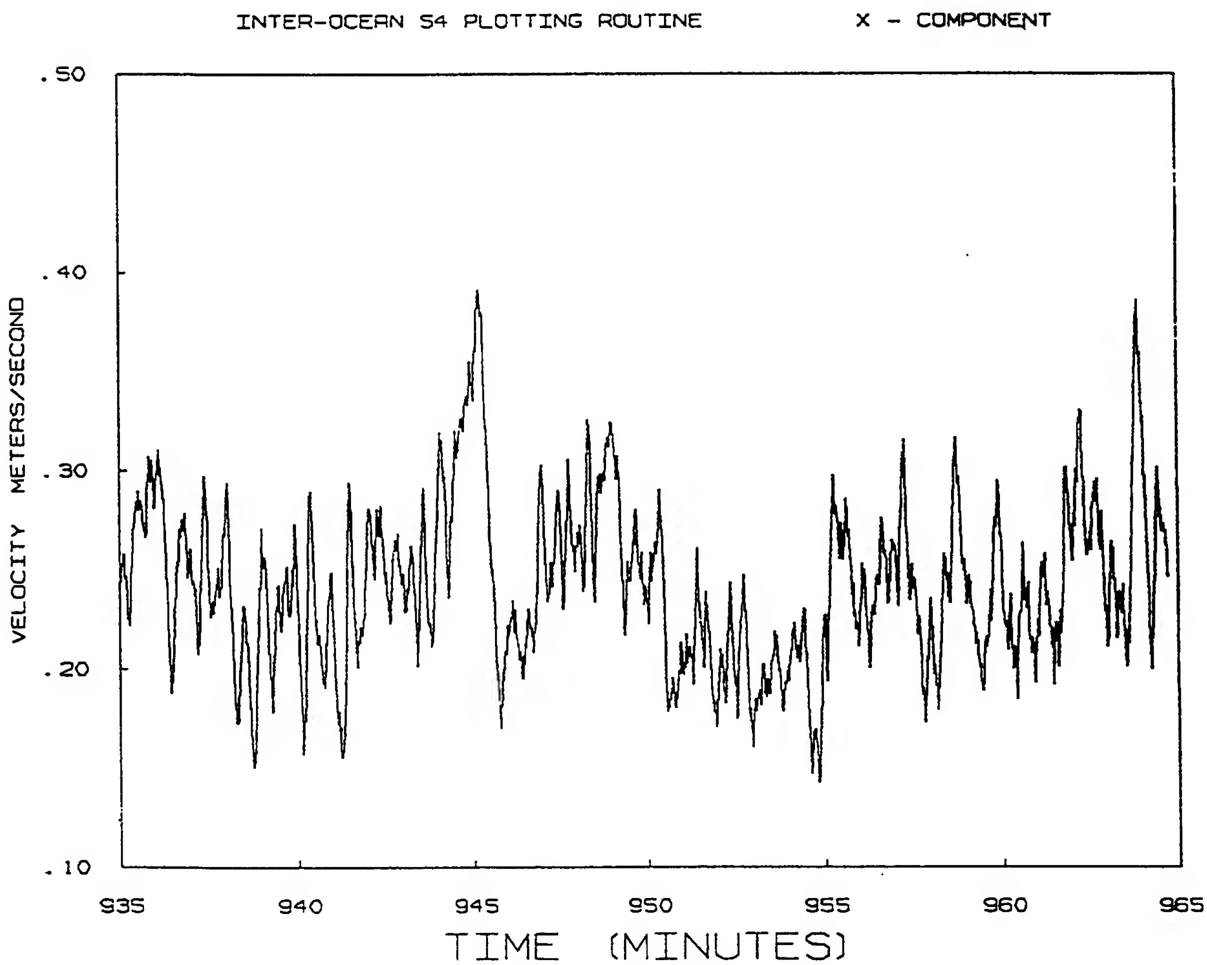
meter number	040	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	MEAN = 0.65	
speed	7.1 mph	VMAX = 0.82	TMAX = 947.
direction	upstream	VMIN = 0.50	TMIN = 938.



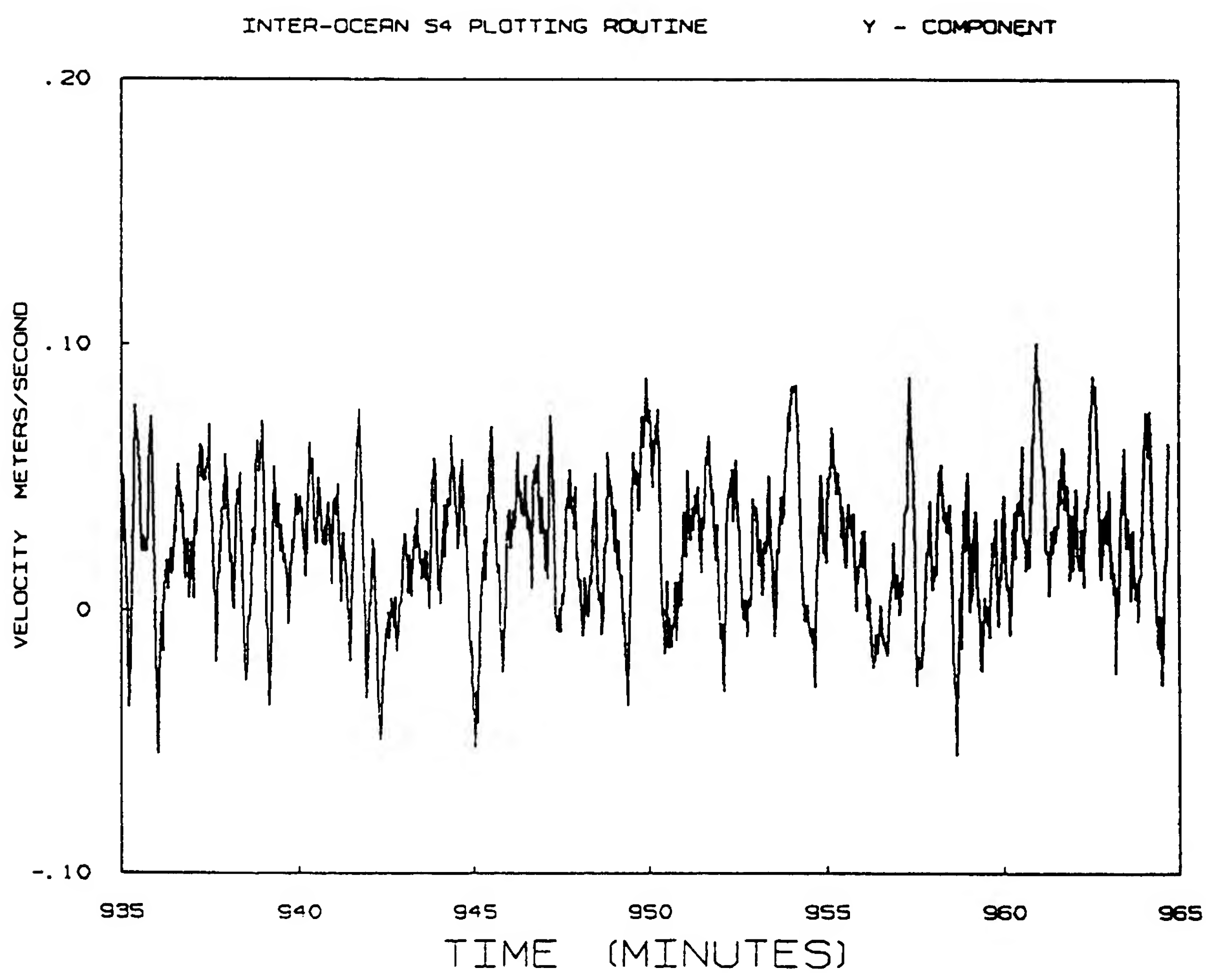
meter number	040	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	MEAN = 0.00	
speed	7.1 mph	VMAX = 0.09	TMAX = 959.
direction	upstream	VMIN = -0.09	TMIN = 964.



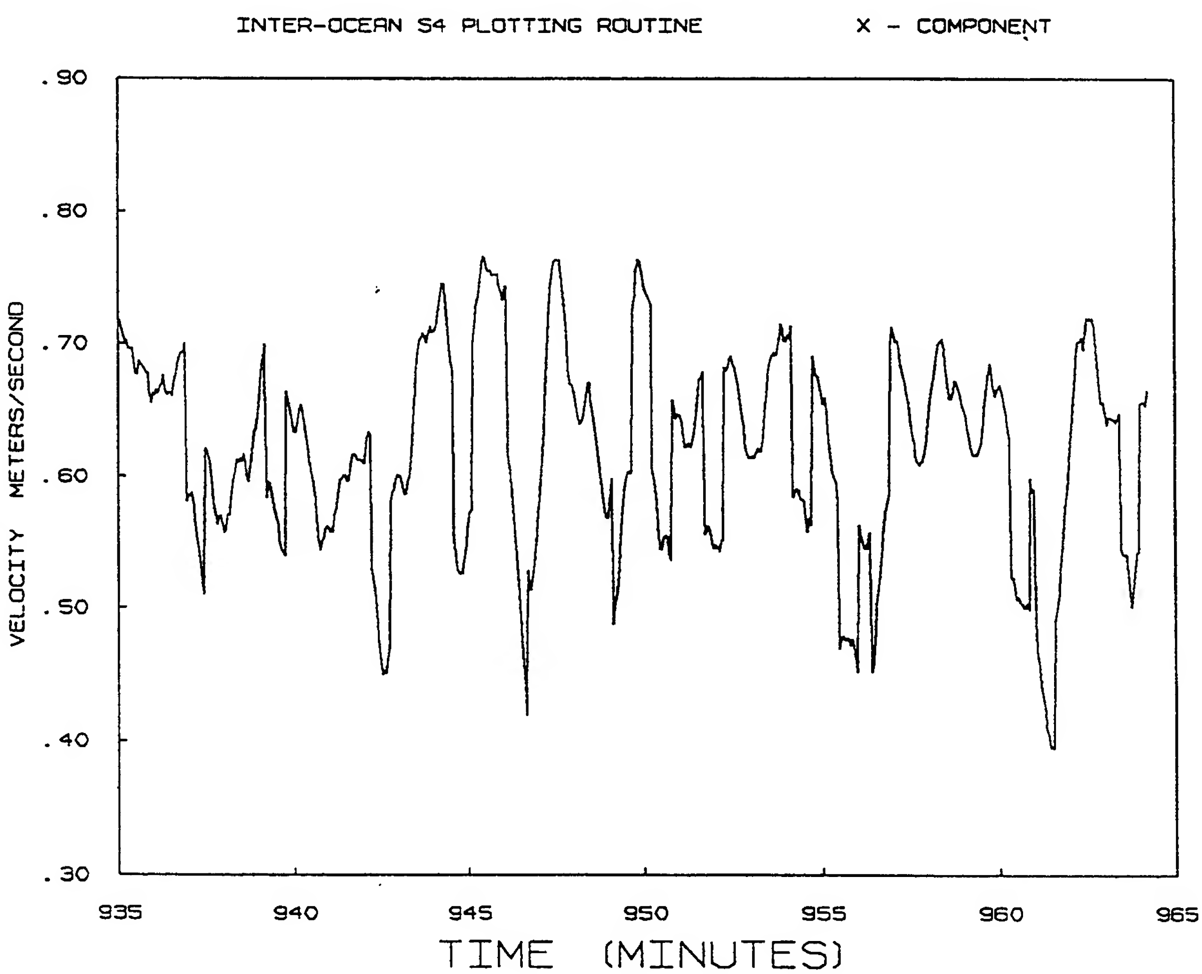
meter number	832	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	MEAN = 0.25	
speed	7.1 mph	VMAX = 0.39	TMAX = 945.
direction	upstream	VMIN = 0.14	TMIN = 955.



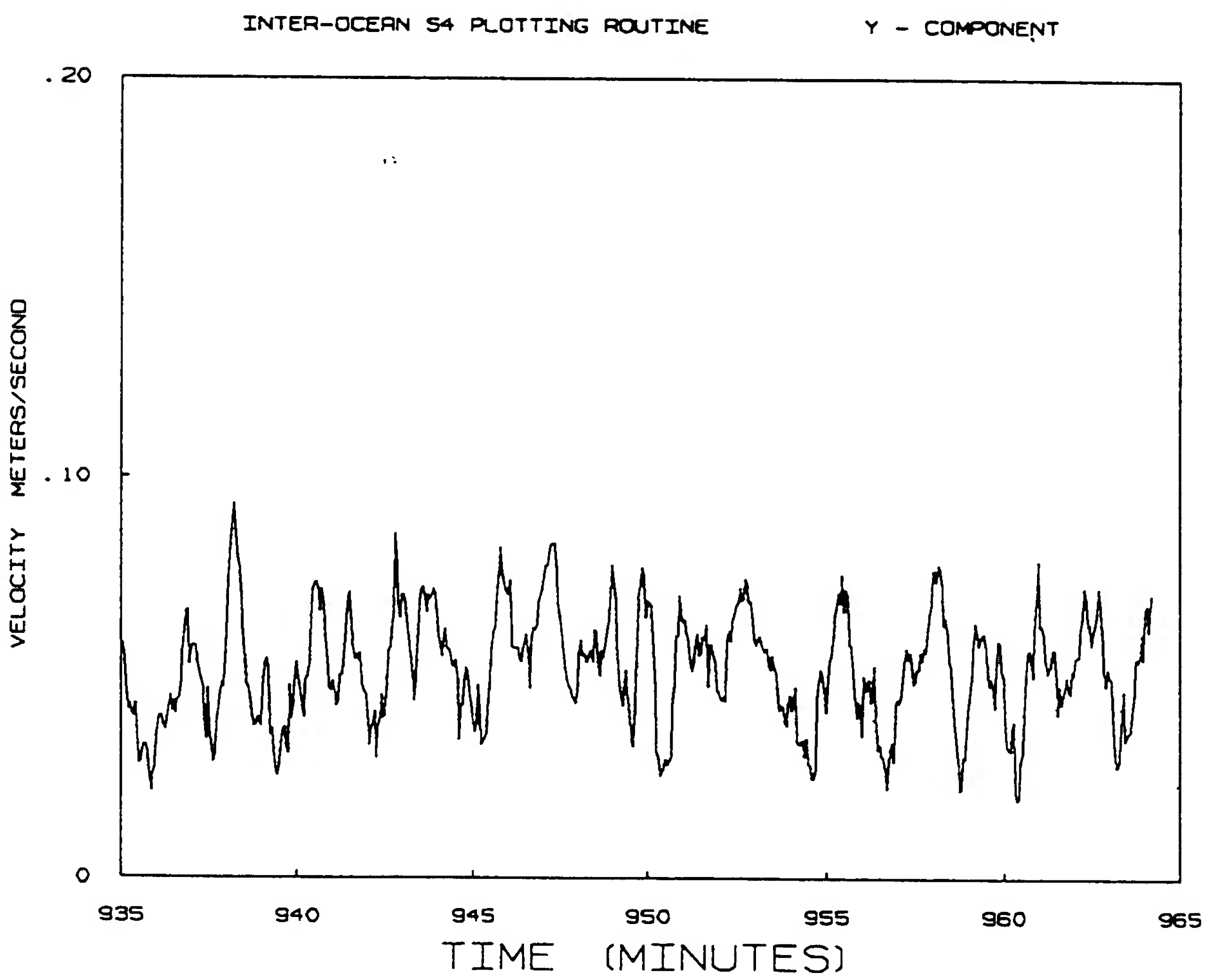
meter number	832	distance	275		
tow name	American	start-time	1535		
configuration	3x5	end-time	1605		
draft	2.0	MEAN =	0.02		
speed	7.1 mph	VMAX =	0.10	TMAX =	961.
direction	upstream	VMIN =	-0.06	TMIN =	959.



meter number	071	distance	275
tow name	American	start–time	1535
configuration	3x5	end–time	1605
draft	2.0	MEAN = 0.60	
speed	7.1 mph	VMAX = 0.77	TMAX = 945.
direction	upstream	VMIN = 0.39	TMIN = 962.

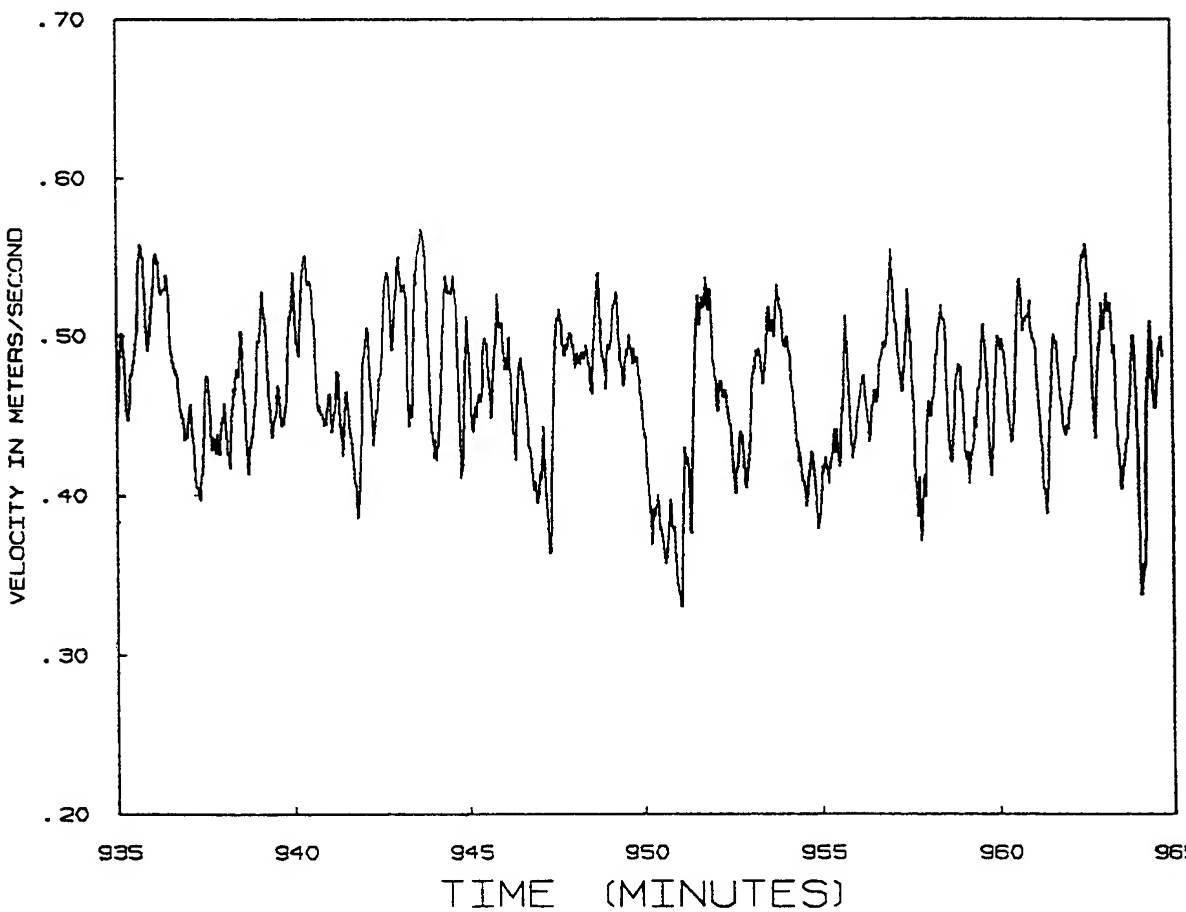


meter number	071	distance	275
tow name	American	start-time	1535
configuration	3x5	end-time	1605
draft	2.0	MEAN =	0.05
speed	7.1 mph	VMAX = 0.09	TMAX = 938.
direction	upstream	VMIN = 0.02	TMIN = 960.



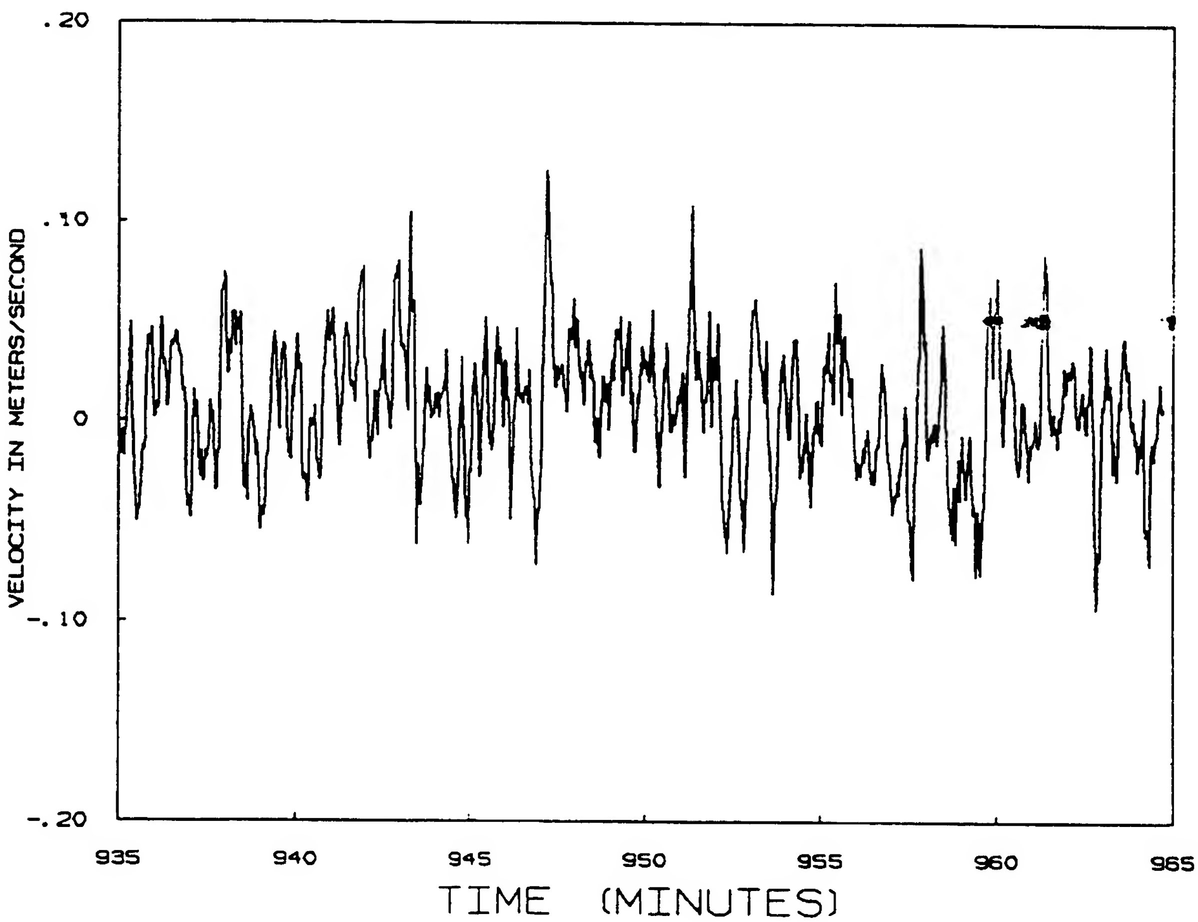
meter number	B-332	start-time	1535
tow name	American	end-time	1605
configuration	3x5	mean =	0.48
draft	2.0	vmax =	0.00 tmax = 944.
speed	7.1 mph	vmin =	0.00 tmin = 951.
direction	upstream		
distance	275		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



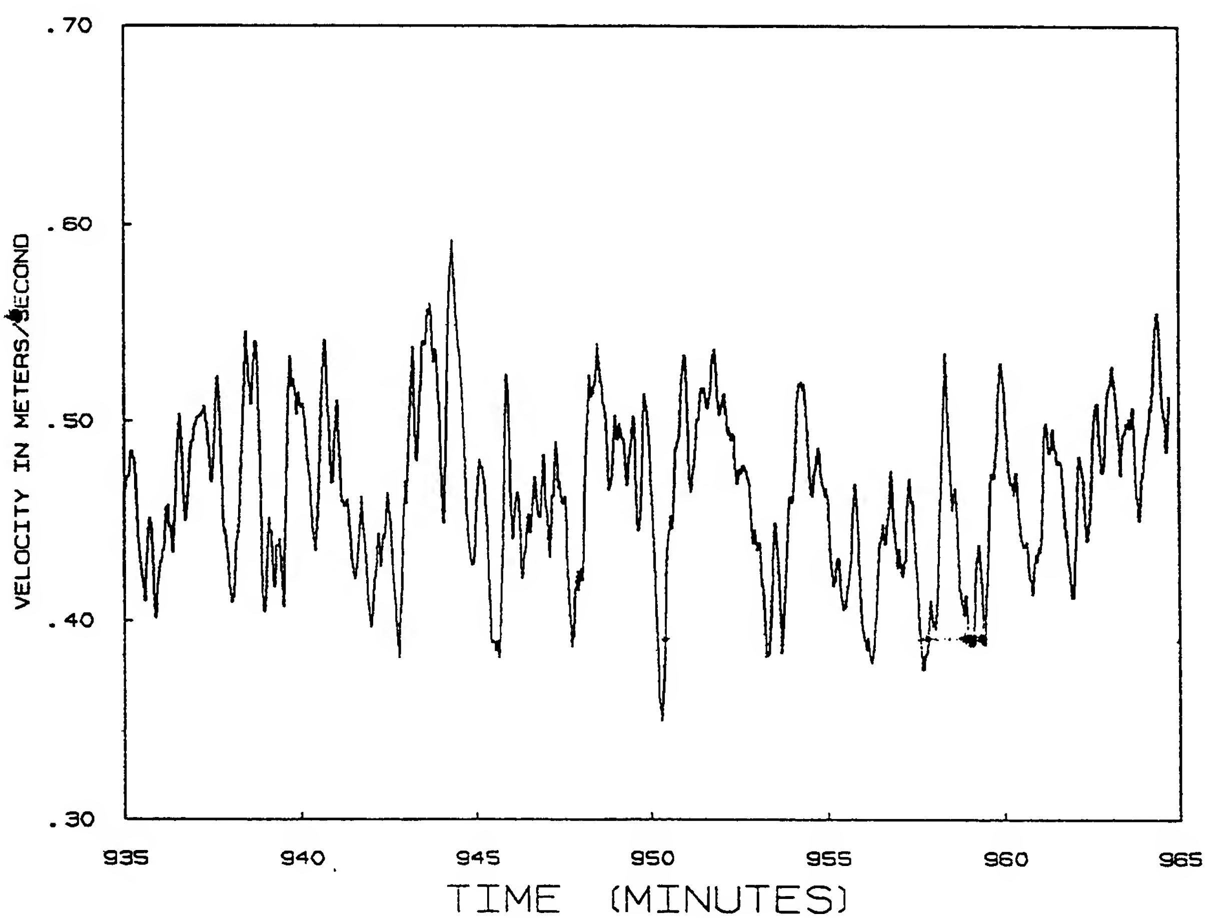
meter number	B-332	start-time	1535
tow name	American	end-time	1605
configuration	3x5	mean =	0.01
draft	2.0	vmax = 0.00	tmax = 947.
speed	7.1 mph	vmin = 0.00	tmin = 963.
direction	upstream		
distance	275		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



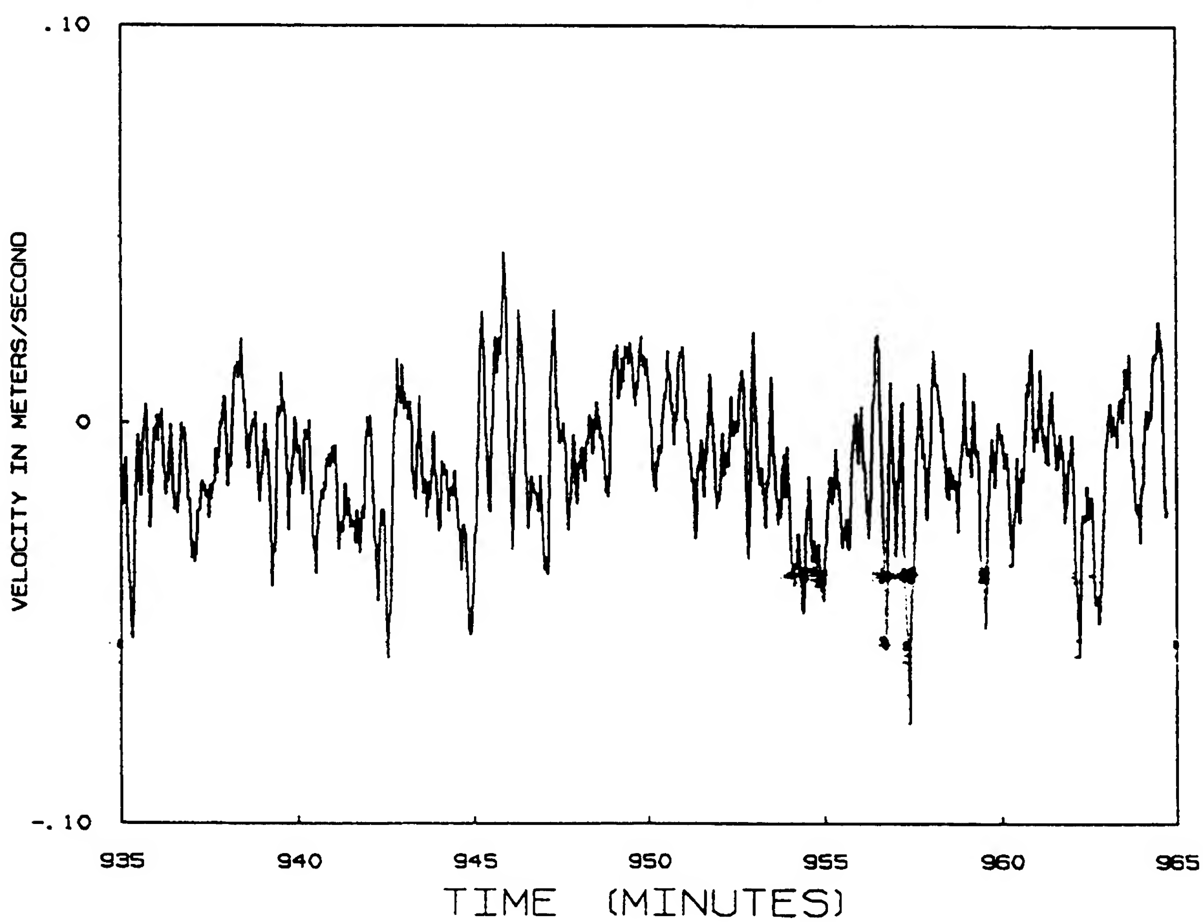
meter number	B-642	start-time	1535
tow name	American	end-time	1605
configuration	3x5	mean = 0.47	
draft	2.0	vmax = 0.00	tmax = 944.
speed	7.1 mph	vmin = 0.00	tmin = 950.
direction	upstream		
distance	275		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



meter number	B-642	start-time	1535
tow name	American	end-time	1605
configuration	3x5	mean =	-0.01
draft	2.0	vmax = 0.00	tmax = 946.
speed	7.1 mph	vmin = 0.00	tmin = 957.
direction	upstream		
distance	275		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



XX-6. Velocity fluctuations measured by two-dimensional current meters
for barge *James F. Neal* at Goose Island, trip 2

James F. Neal (7/18/91)

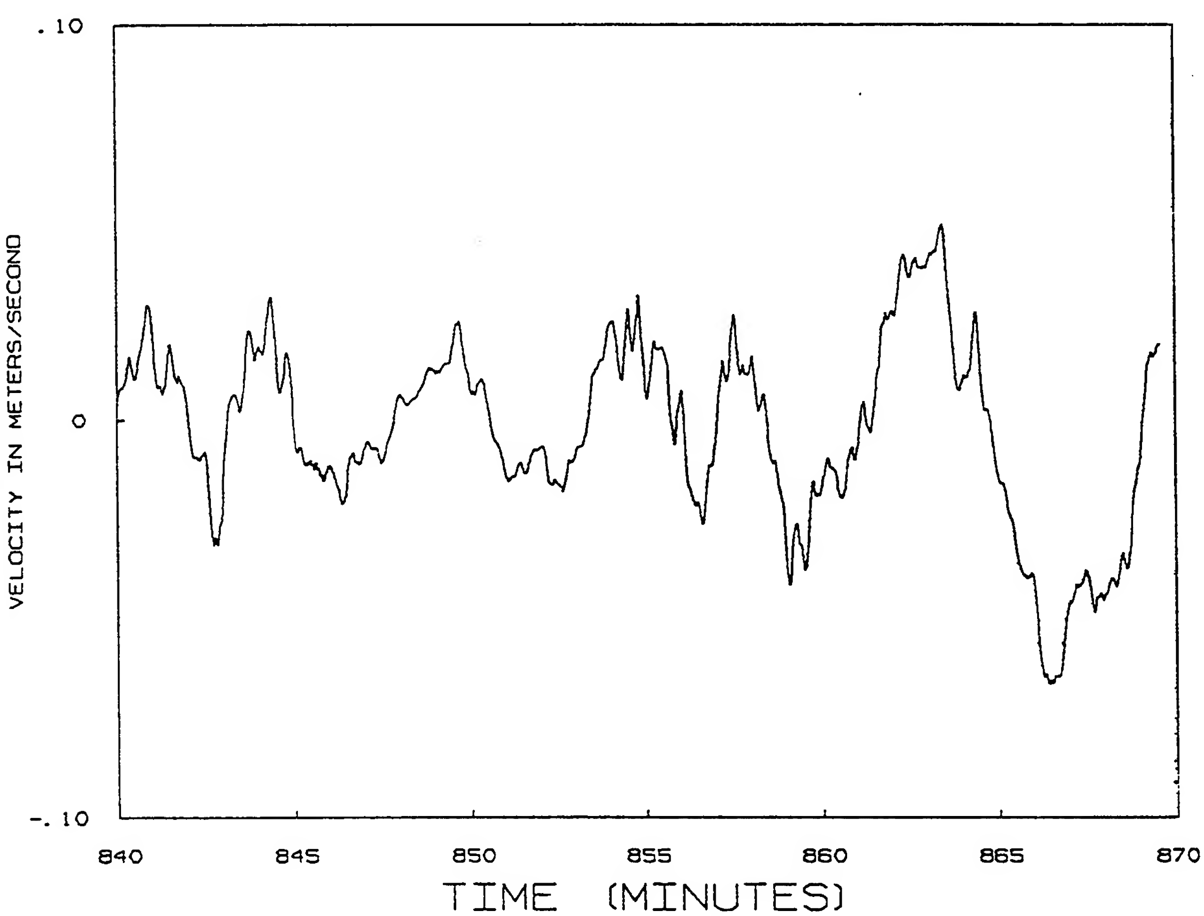
Status of Electromagnetic Current Meters:

998 (MMB511) √	1000 (MMB511) √	999 (MMB511) √	1130 (MMB511) √	1131 (MMB511) √	1001 (MMB511) √
642 (MMB527) √	332 (MMB527) √				
071 (S4) √	834 (S4) √	040 (S4) √	832 (S4) -	151 (S4) √	

Note: √ : Working
* : Not working
- : Unavailable

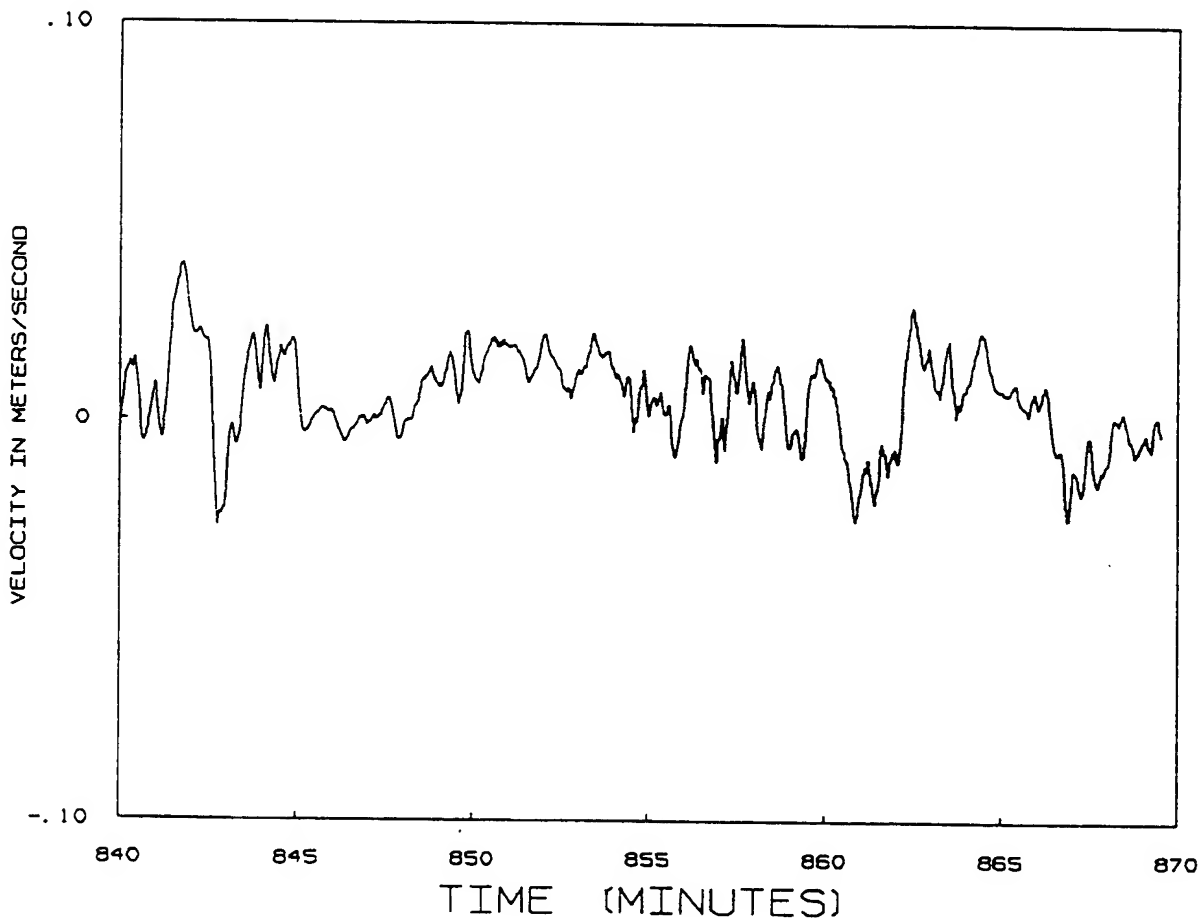
meter number	998	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.00
speed	9.1 mph	vmax =	0.05 tmax = 863.
direction	downstream	vmin =	-0.07 tmin = 866.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

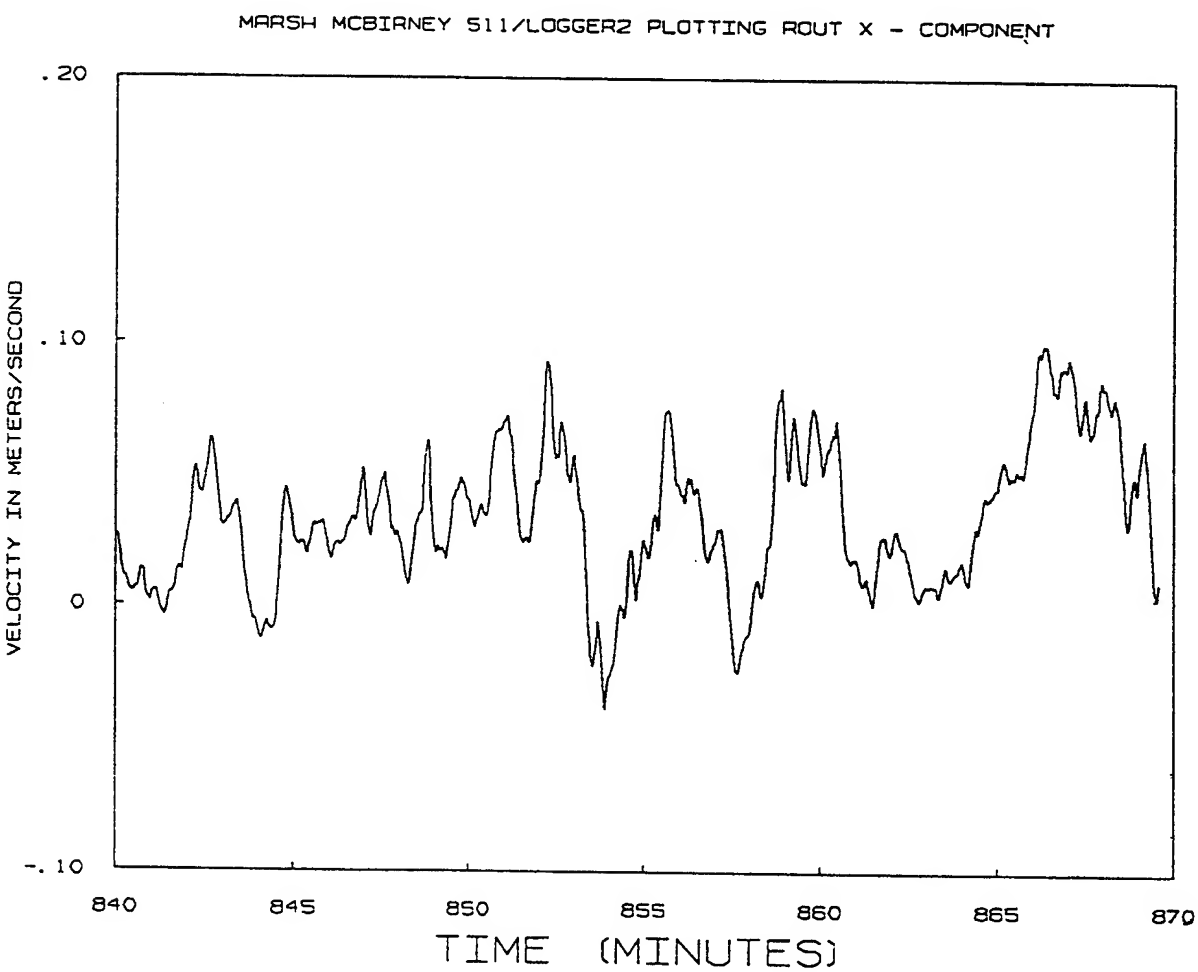


meter number	998	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.01
speed	9.1 mph	vmax =	0.04 tmax = 842.
direction	downstream	vmin =	-0.03 tmin = 843.

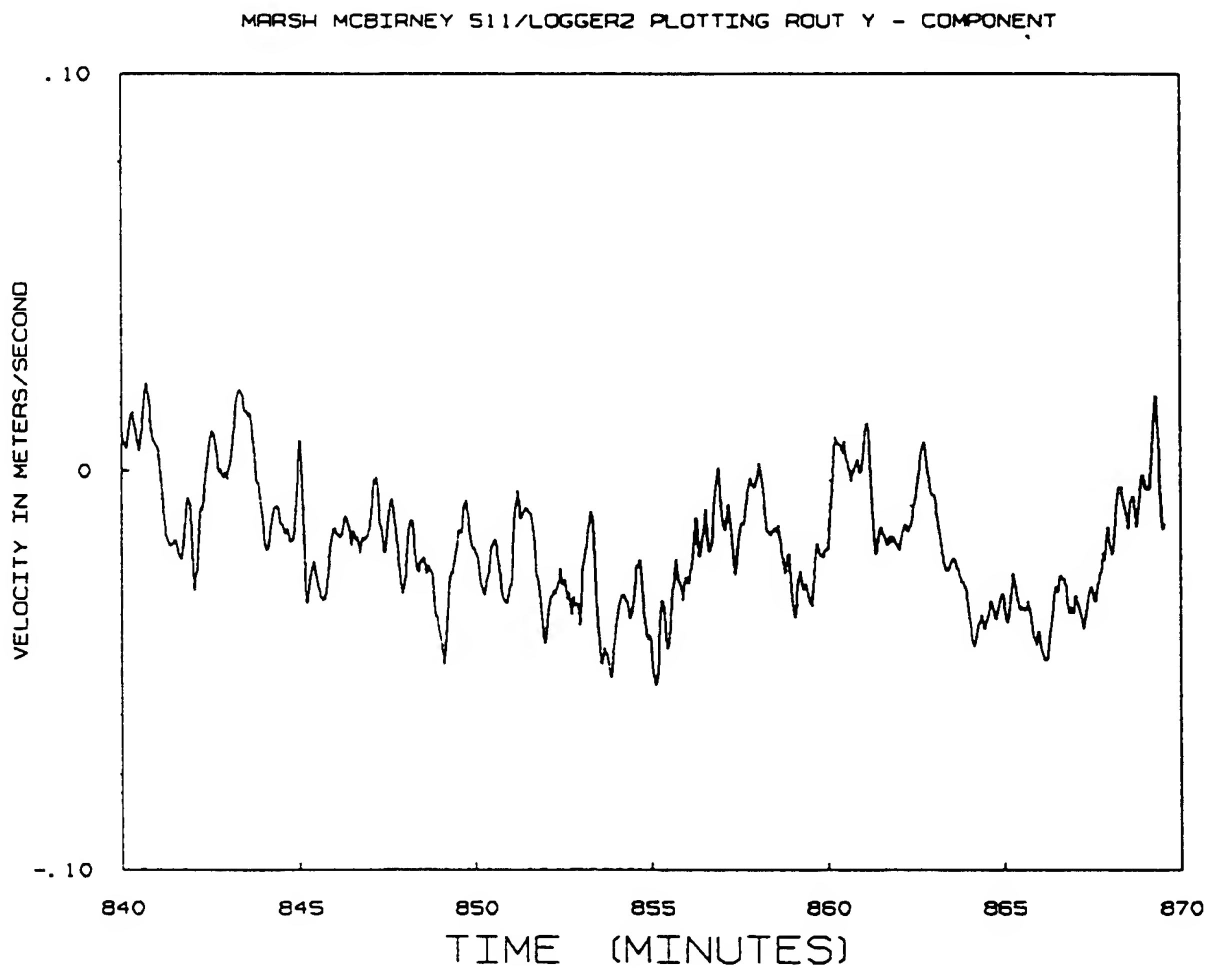
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



meter number	1000	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.02
speed	9.1 mph	vmax = 0.10	tmax = 866.
direction	downstream	vmin = −0.04	tmin = 854.

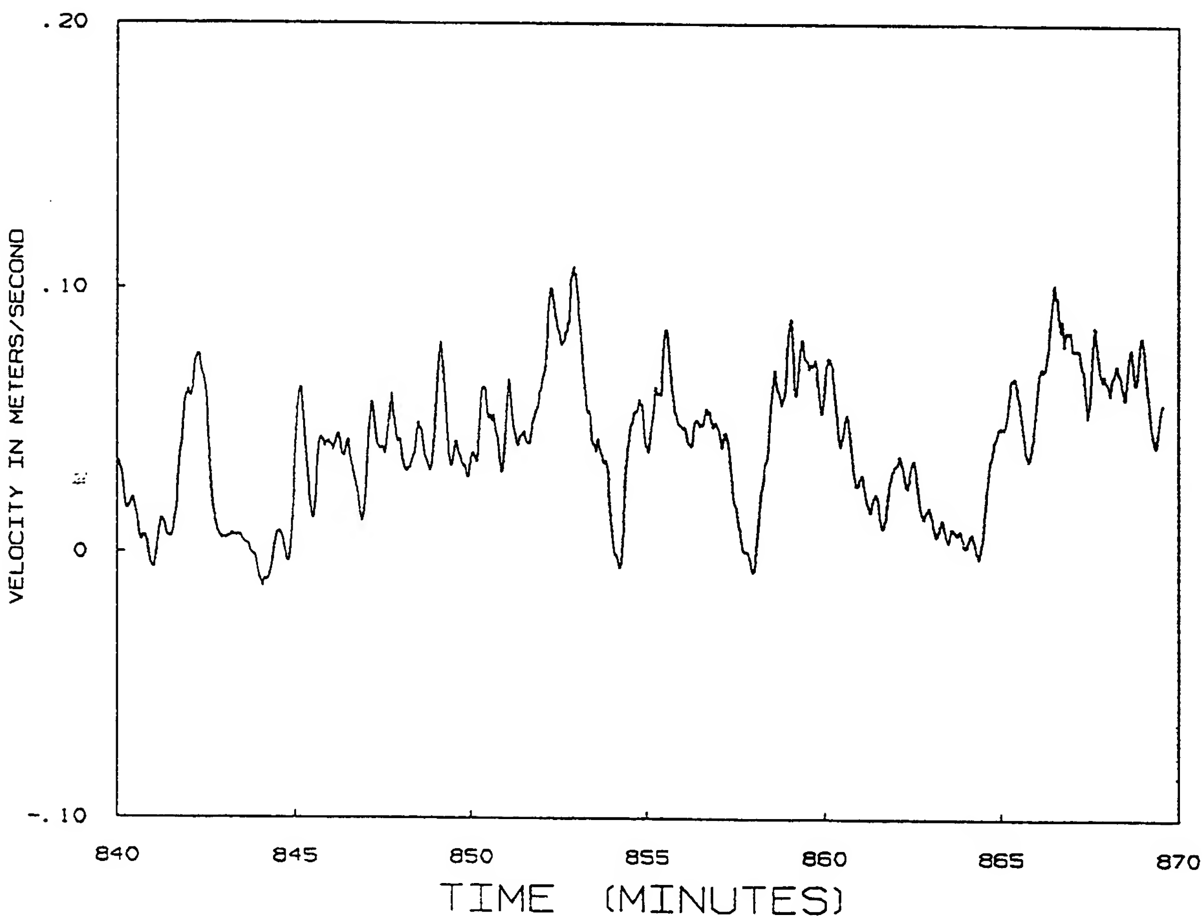


meter number	1000	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean = -0.01	
speed	9.1 mph	vmax = 0.02	tmax = 841.
direction	downstream	vmin = -0.05	tmin = 855.

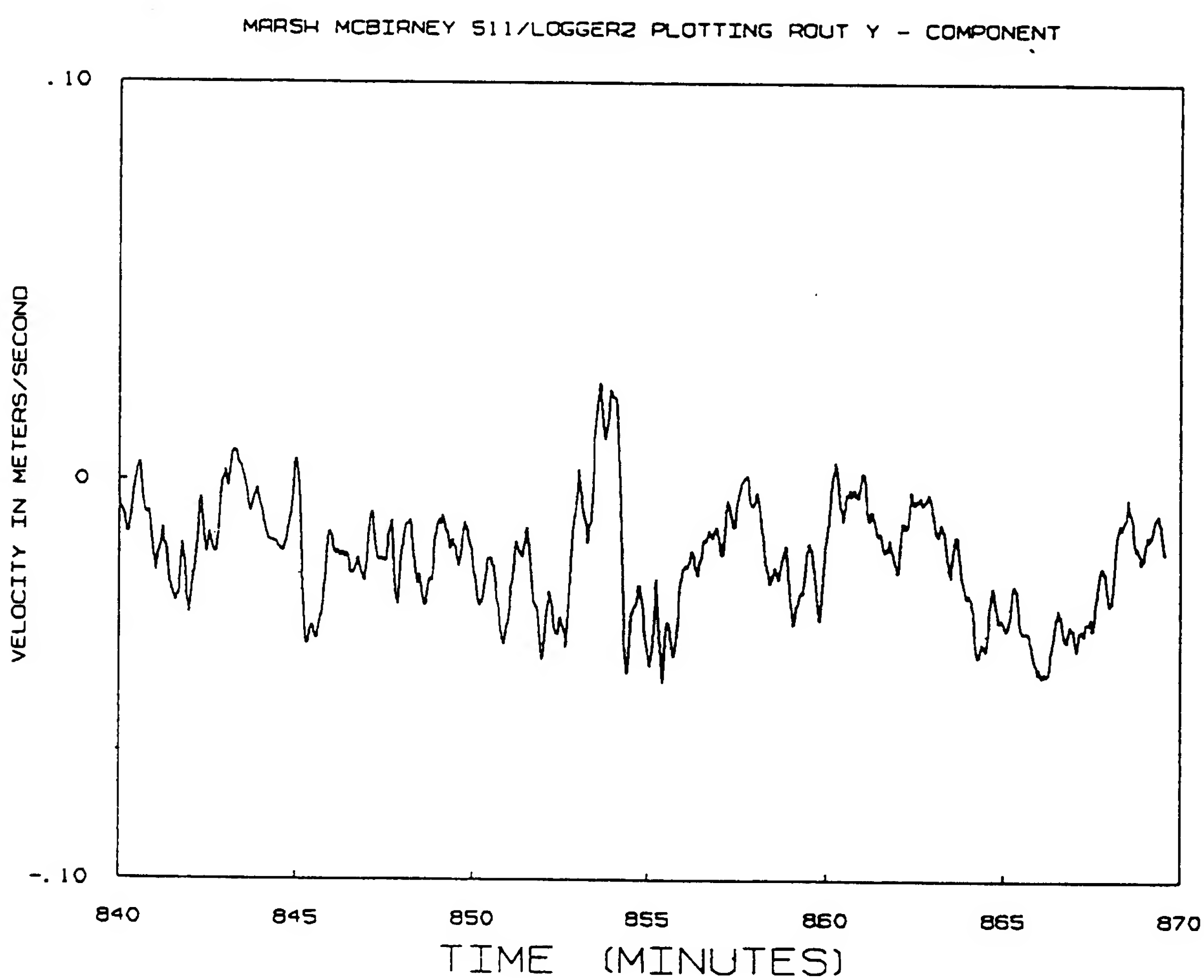


meter number	999	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.03
speed	9.1 mph	vmax = 0.11	tmax = 853.
direction	downstream	vmin = -0.01	tmin = 844.

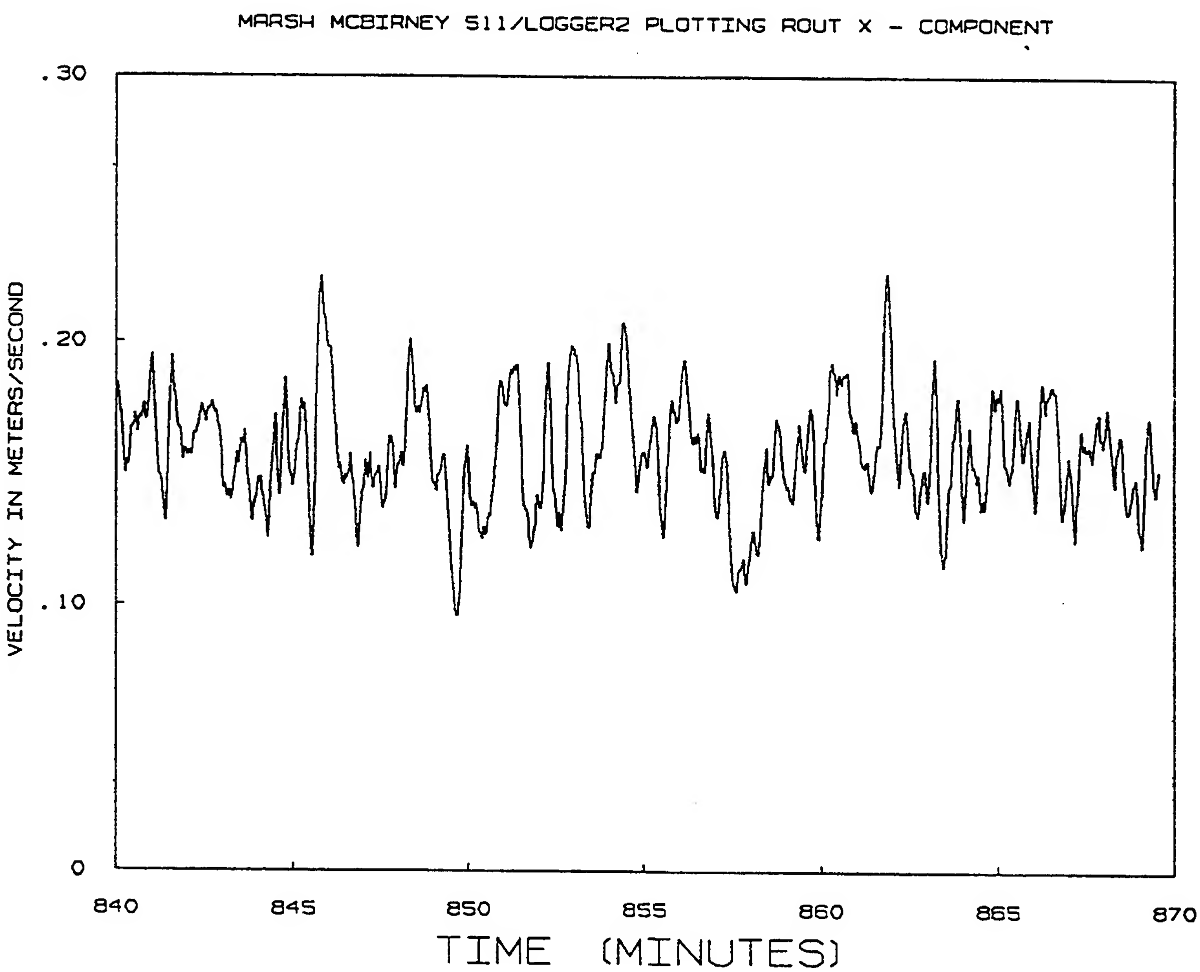
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



meter number	999	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean = -0.02	
speed	9.1 mph	vmax = 0.02	tmax = 854.
direction	downstream	vmin = -0.05	tmin = 855.

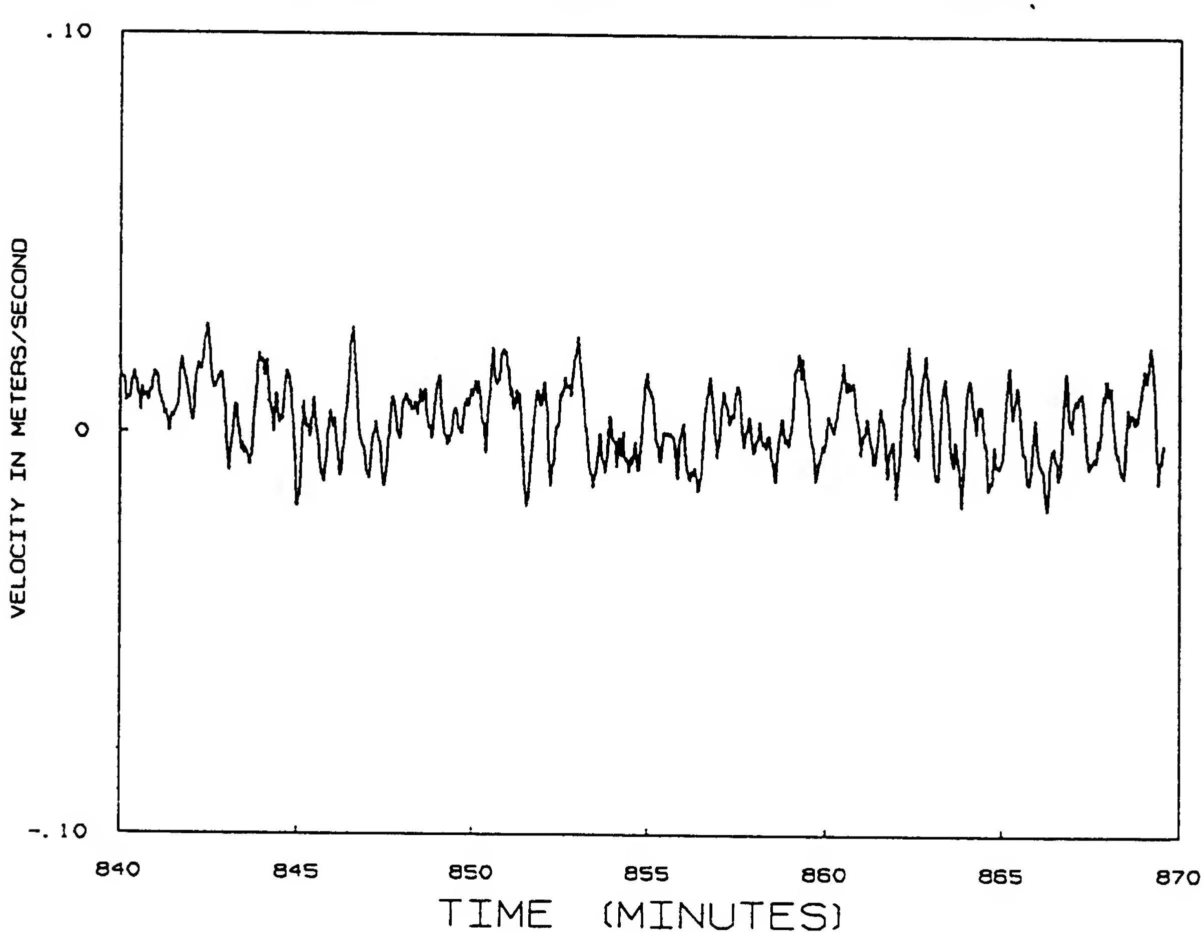


meter number	1130	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean = 0.16	
speed	9.1 mph	vmax = 0.23	tmax = 862.
direction	downstream	vmin = 0.10	tmin = 850.

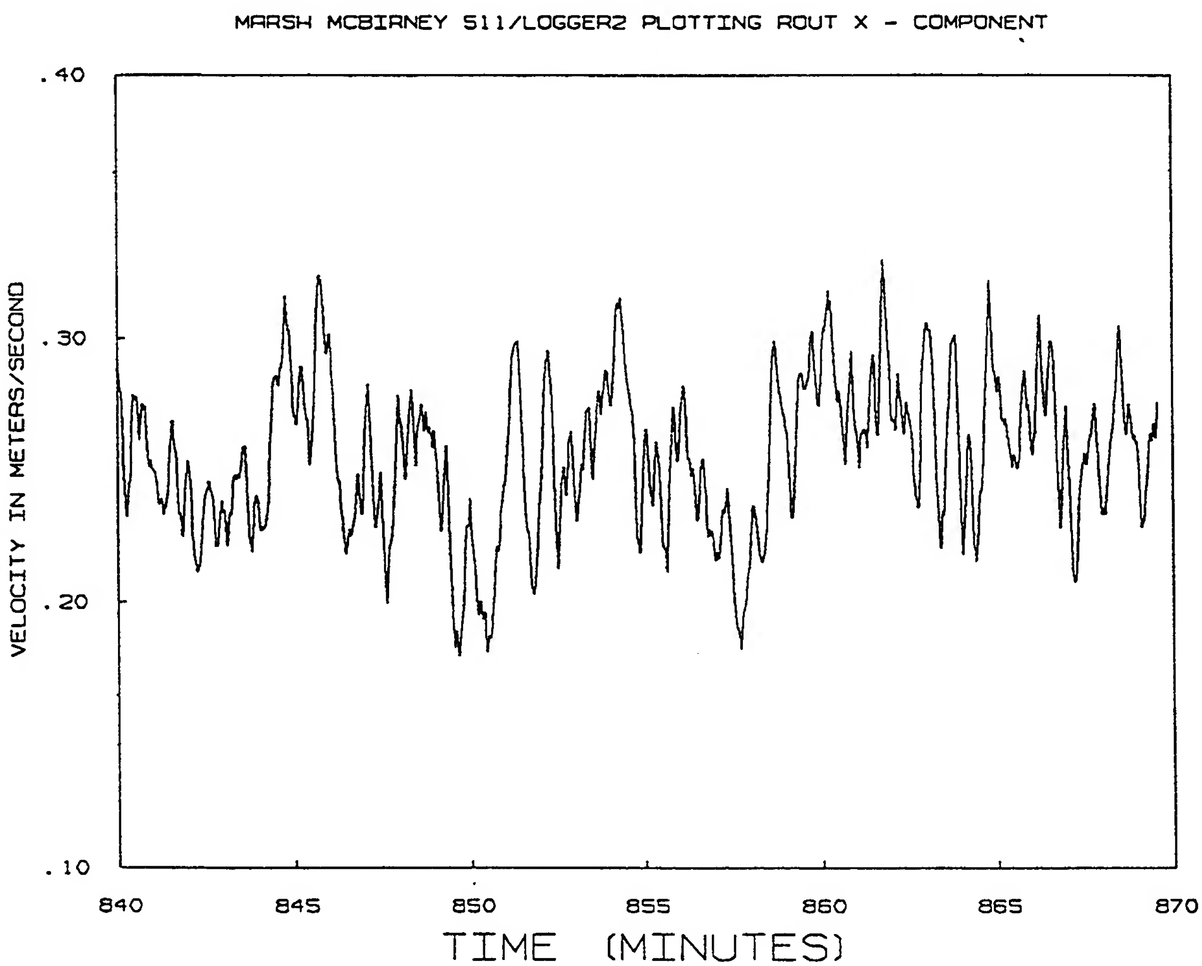


meter number	1130	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.01
speed	9.1 mph	vmax = 0.03	tmax = 842.
direction	downstream	vmin = -0.02	tmin = 866.

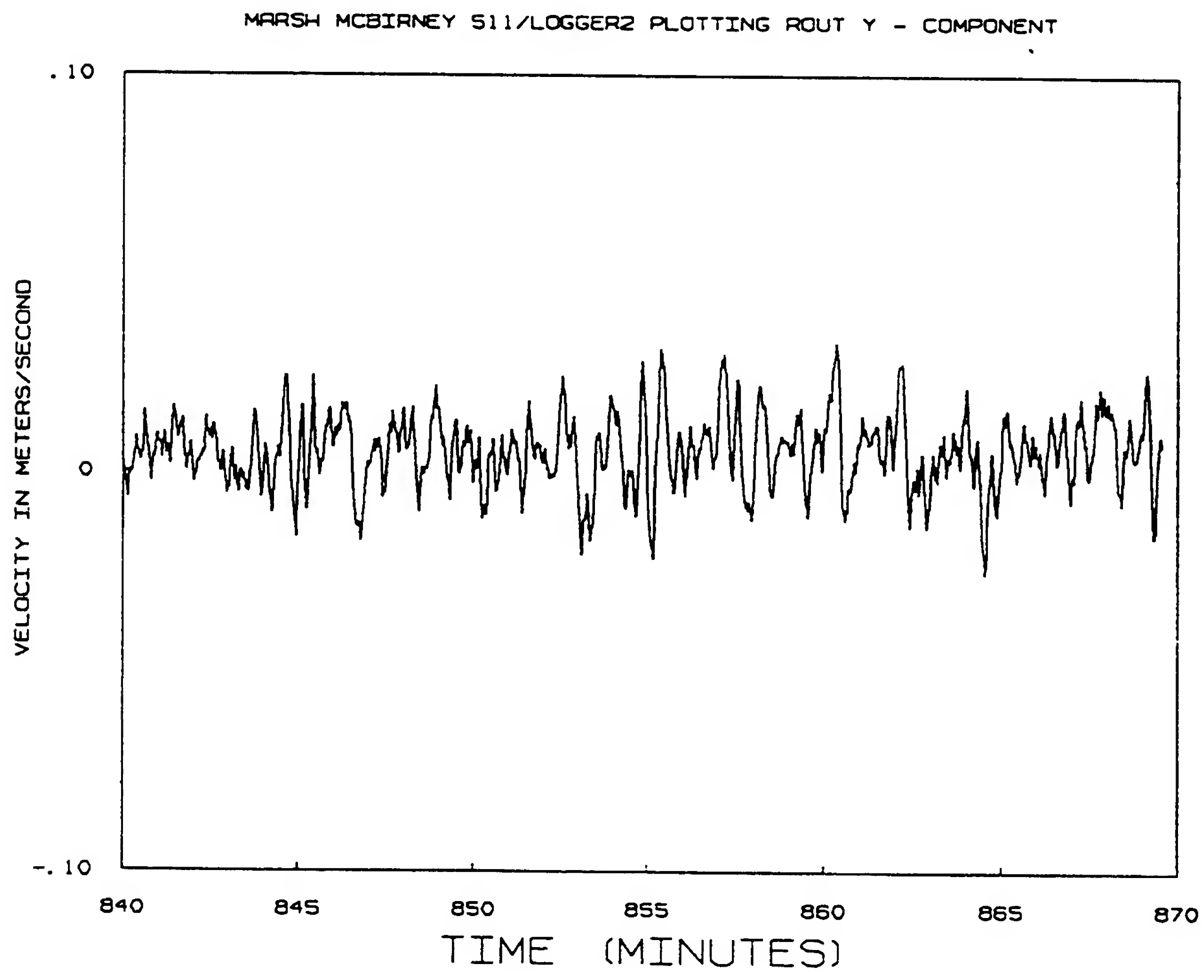
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



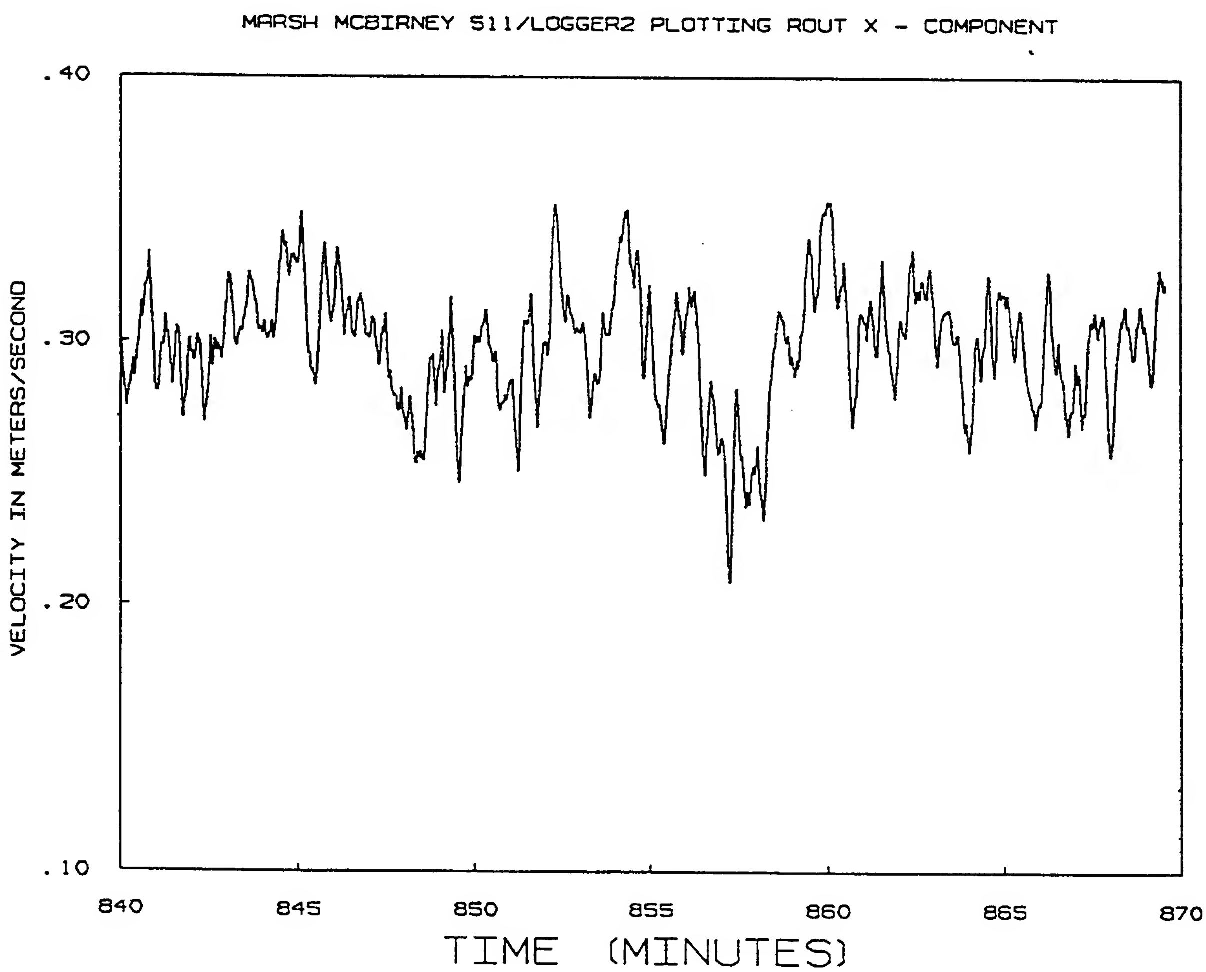
meter number	1131	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.25
speed	9.1 mph	vmax =	0.33 tmax = 862.
direction	downstream	vmin =	0.18 tmin = 850.



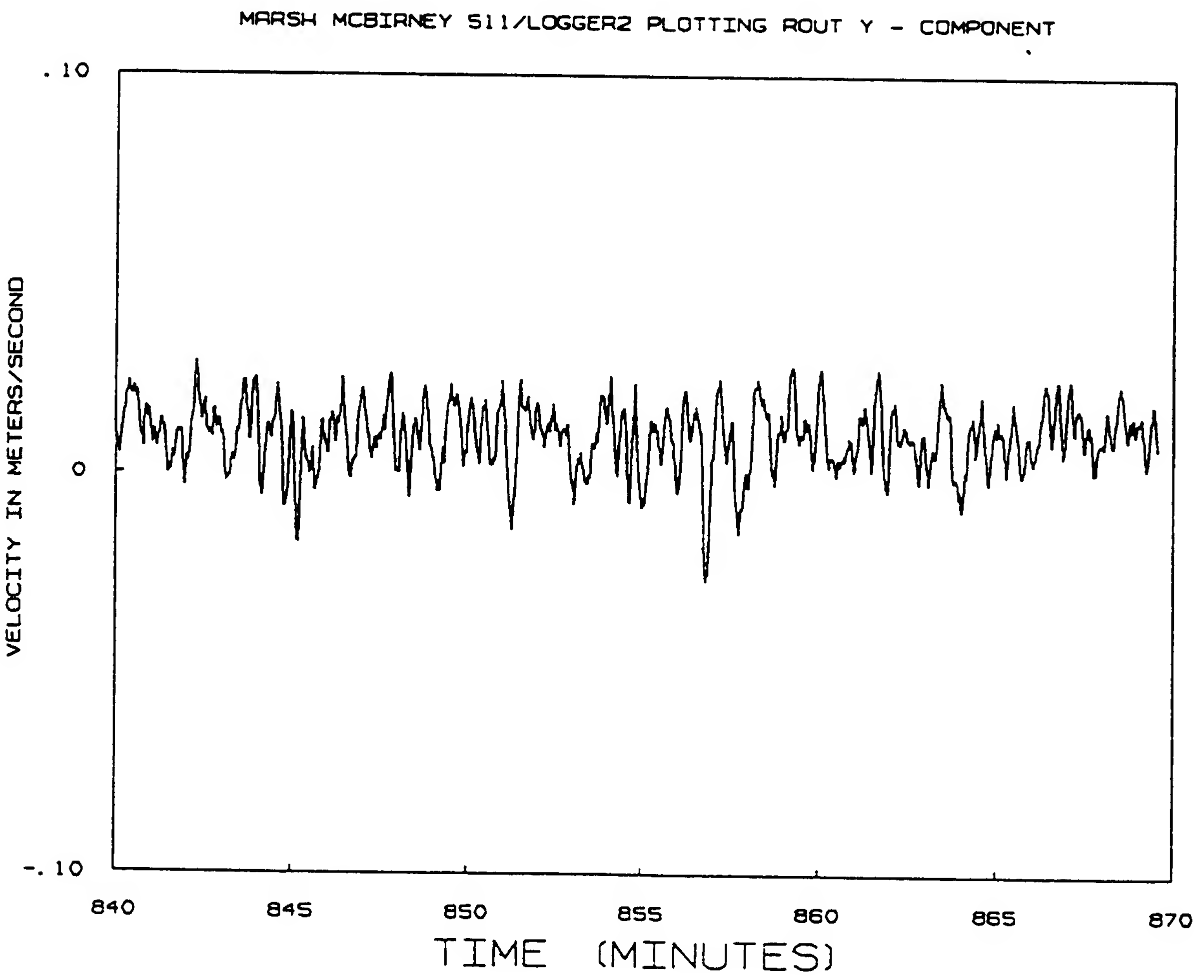
meter number	1131	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.00
speed	9.1 mph	vmax = 0.03	tmax = 860.
direction	downstream	vmin = -0.03	tmin = 865.



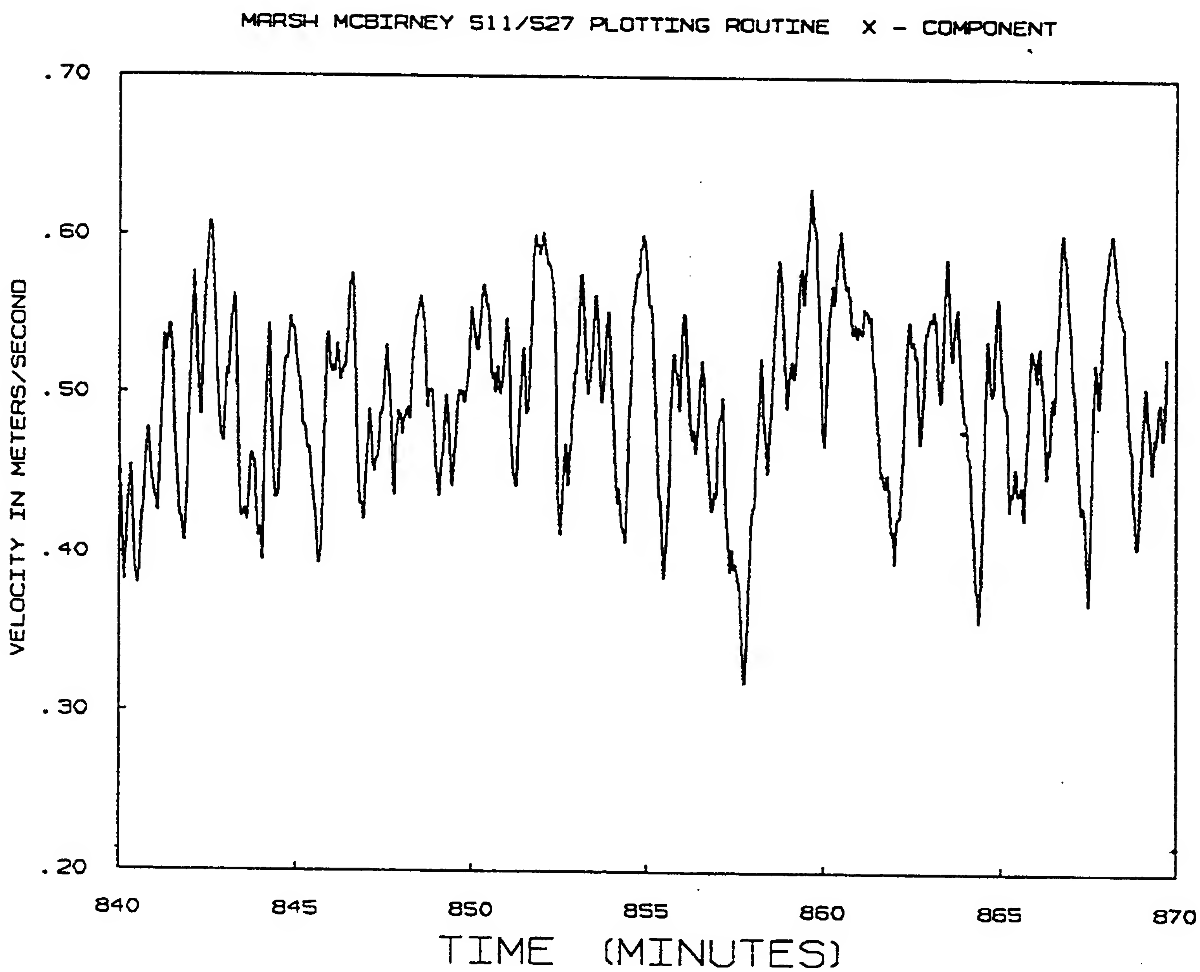
meter number	1001	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.30
speed	9.1 mph	vmax =	0.35 tmax = 860.
direction	downstream	vmin =	0.21 tmin = 857.



meter number	1001	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	mean =	0.01
speed	9.1 mph	vmax = 0.03	tmax = 842.
direction	downstream	vmin = −0.03	tmin = 857.

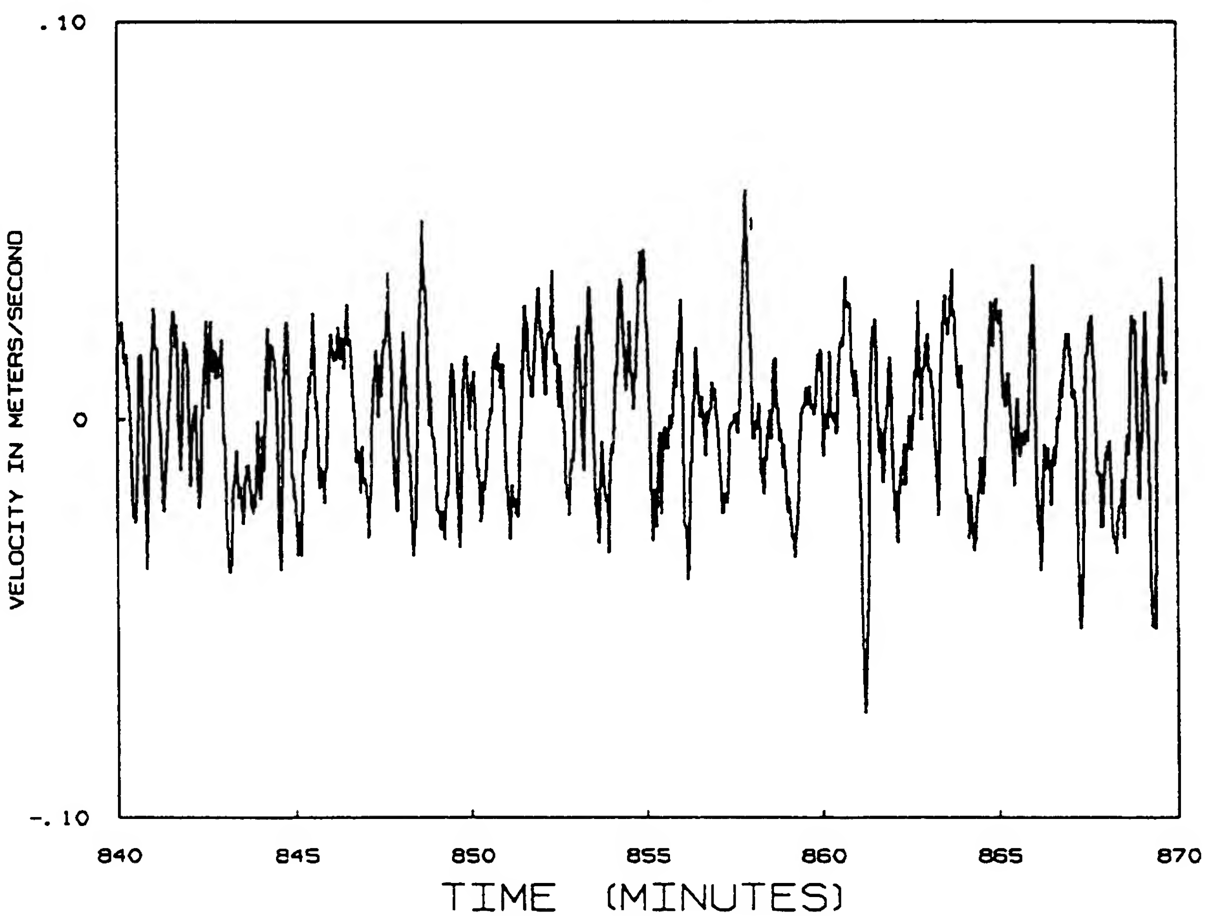


meter number	B-642	start-time	1400
tow name	james F.	end-time	1430
configuration	3x5	mean =	0.48
draft	9.0	vmax = 0.00	tmax = 860.
speed	9.1 mph	vmin = 0.00	tmin = 858.
direction	downstream		
distance	310		

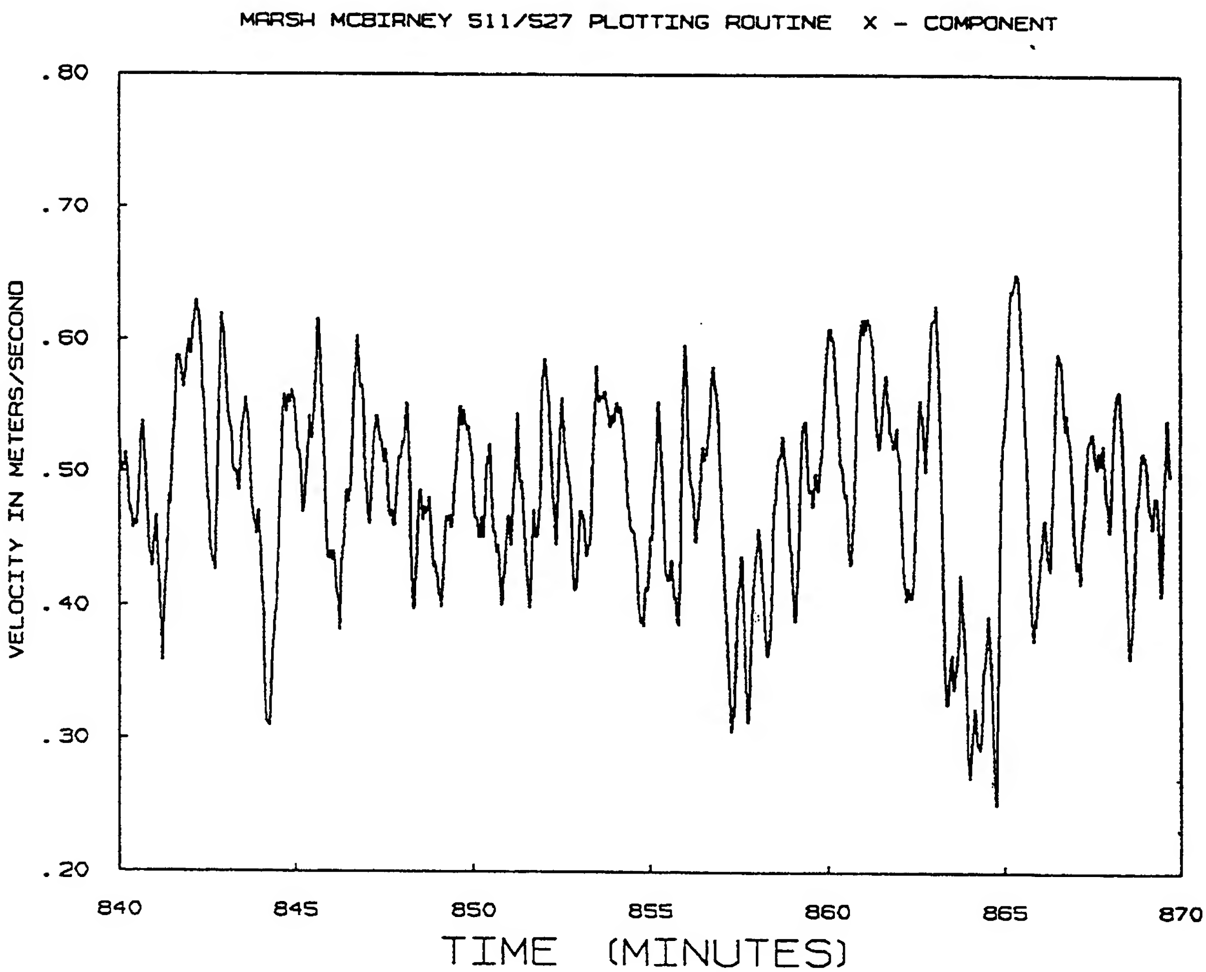


meter number	B-642	start-time	1400
tow name	james F.	end-time	1430
configuration	3x5	mean =	0.00
draft	9.0	vmax =	0.00 tmax = 858.
speed	9.1 mph	vmin =	0.00 tmin = 861.
direction	downstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT

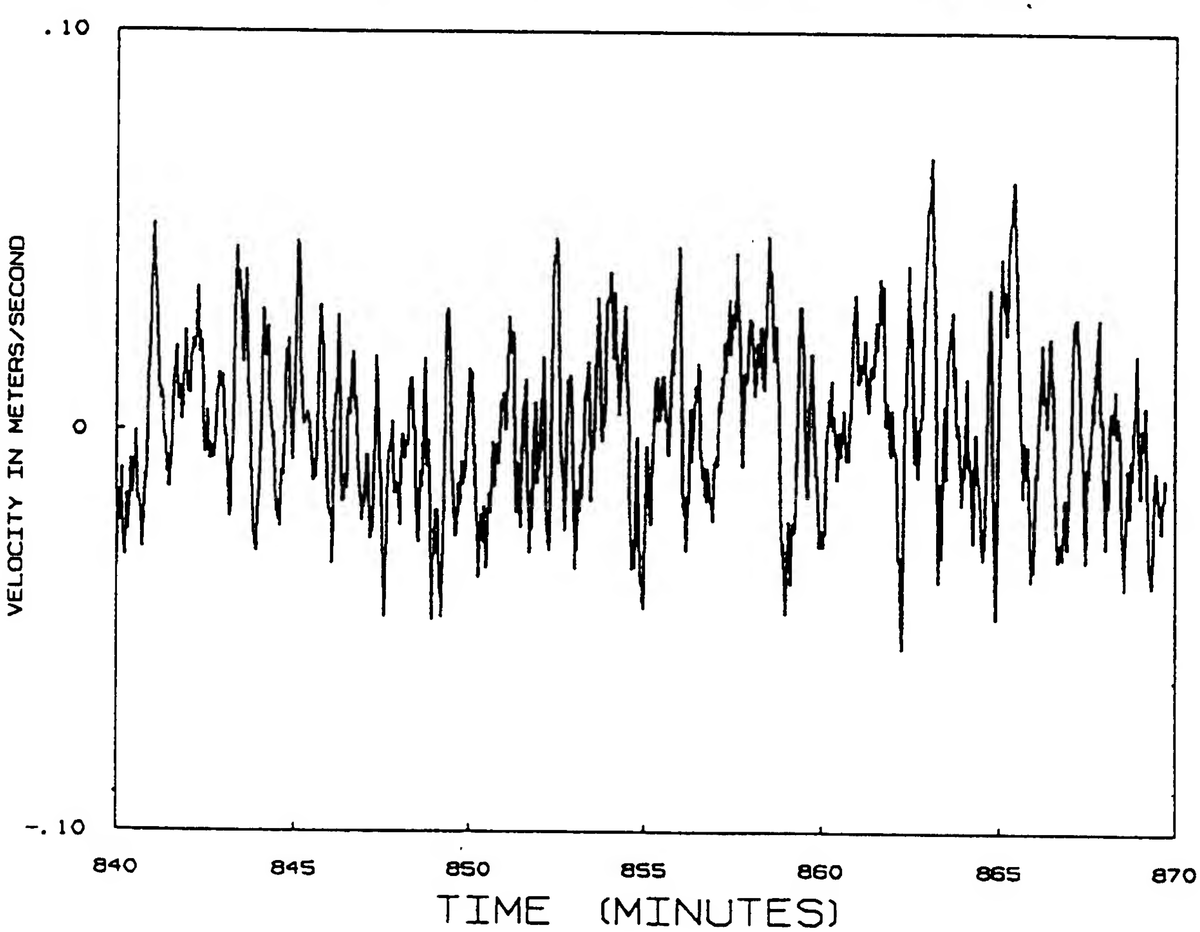


meter number	B-332	start-time	1400
tow name	james F.	end-time	1430
configuration	3x5	mean =	0.50
draft	9.0	vmax = 0.00	tmax = 865.
speed	9.1 mph	vmin = 0.00	tmin = 865.
direction	downstream		
distance	310		



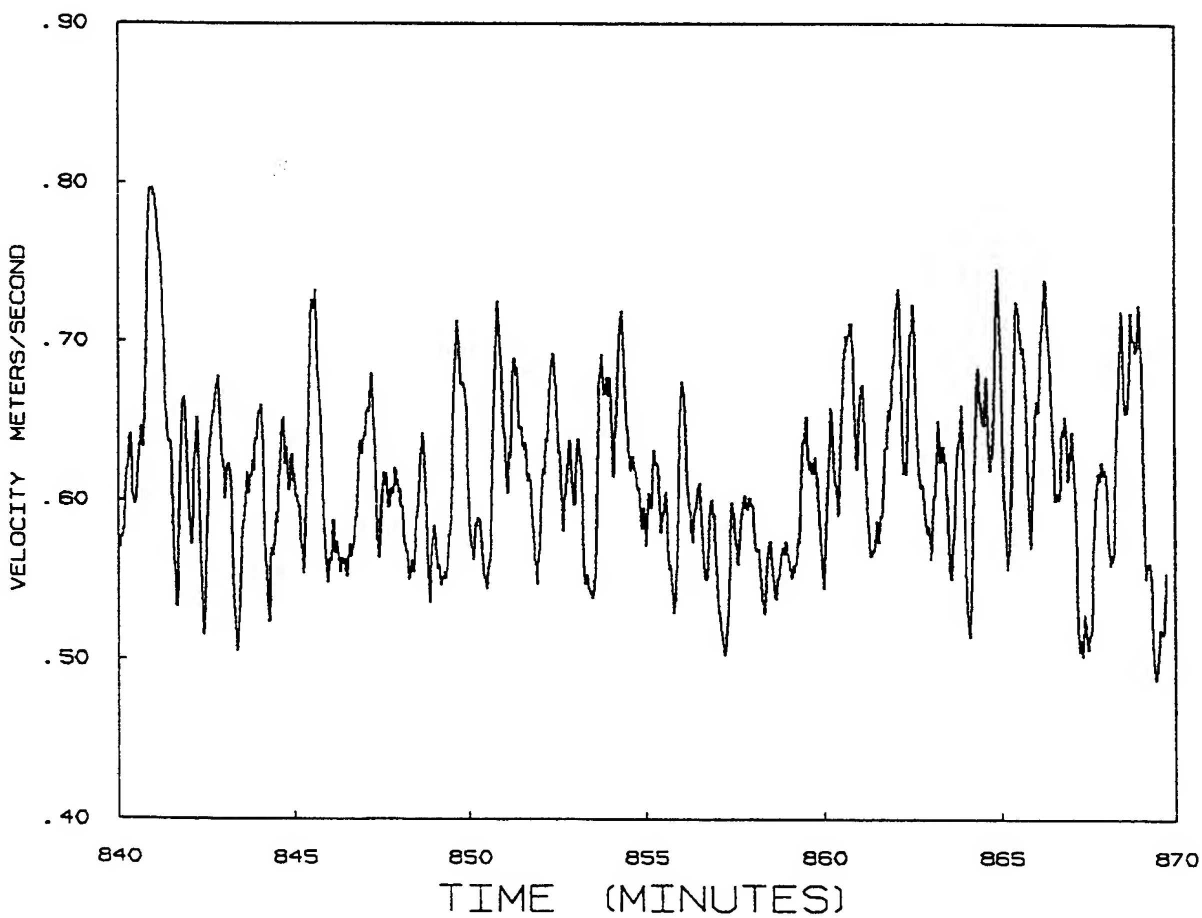
meter number	B-332	start-time	1400
tow name	james F.	end-time	1430
configuration	3x5	mean =	0.00
draft	9.0	vmax =	0.00 tmax = 863.
speed	9.1 mph	vmin =	0.00 tmin = 862.
direction	downstream		
distance	310		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT

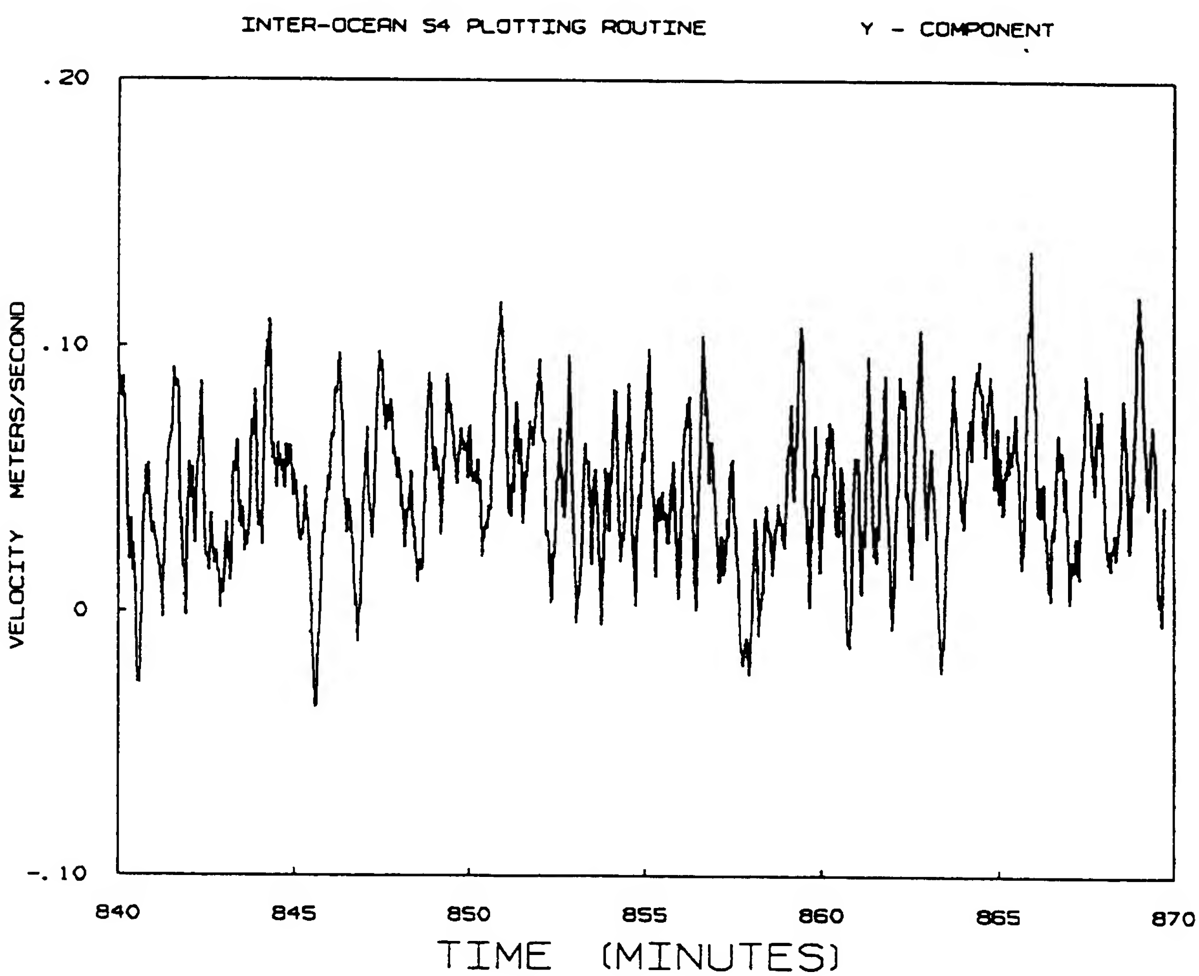


meter number	071	distance	310			
tow name	james F.	start-time	1400			
configuration	3x5	end-time	1430			
draft	9.0	MEAN =	0.61			
speed	9.1 mph	VMAX =	0.80	TMAX =	841.	
direction	downstream	VMIN =	0.49	TMIN =	869.	

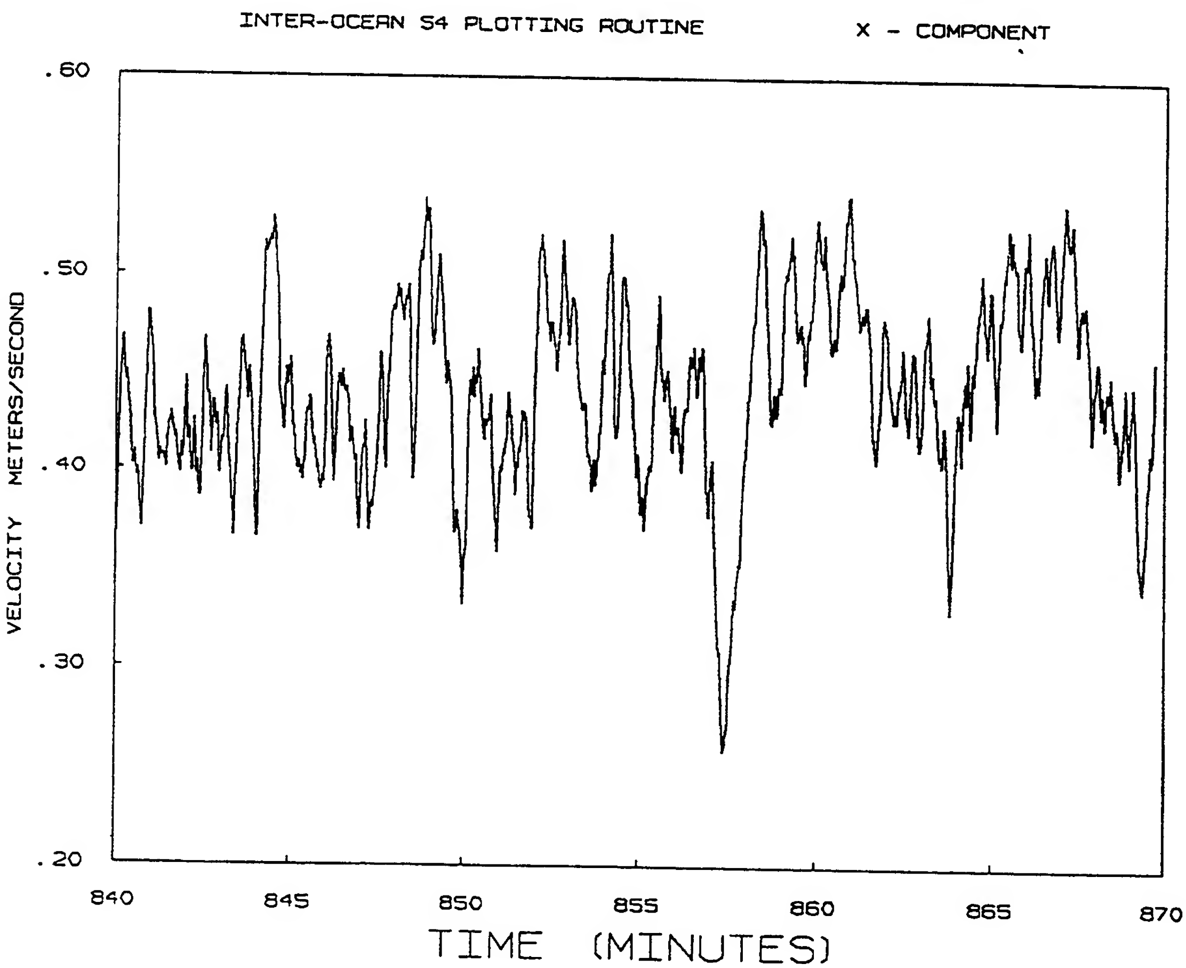
INTER-OCEAN S4 PLOTTING ROUTINE X - COMPONENT



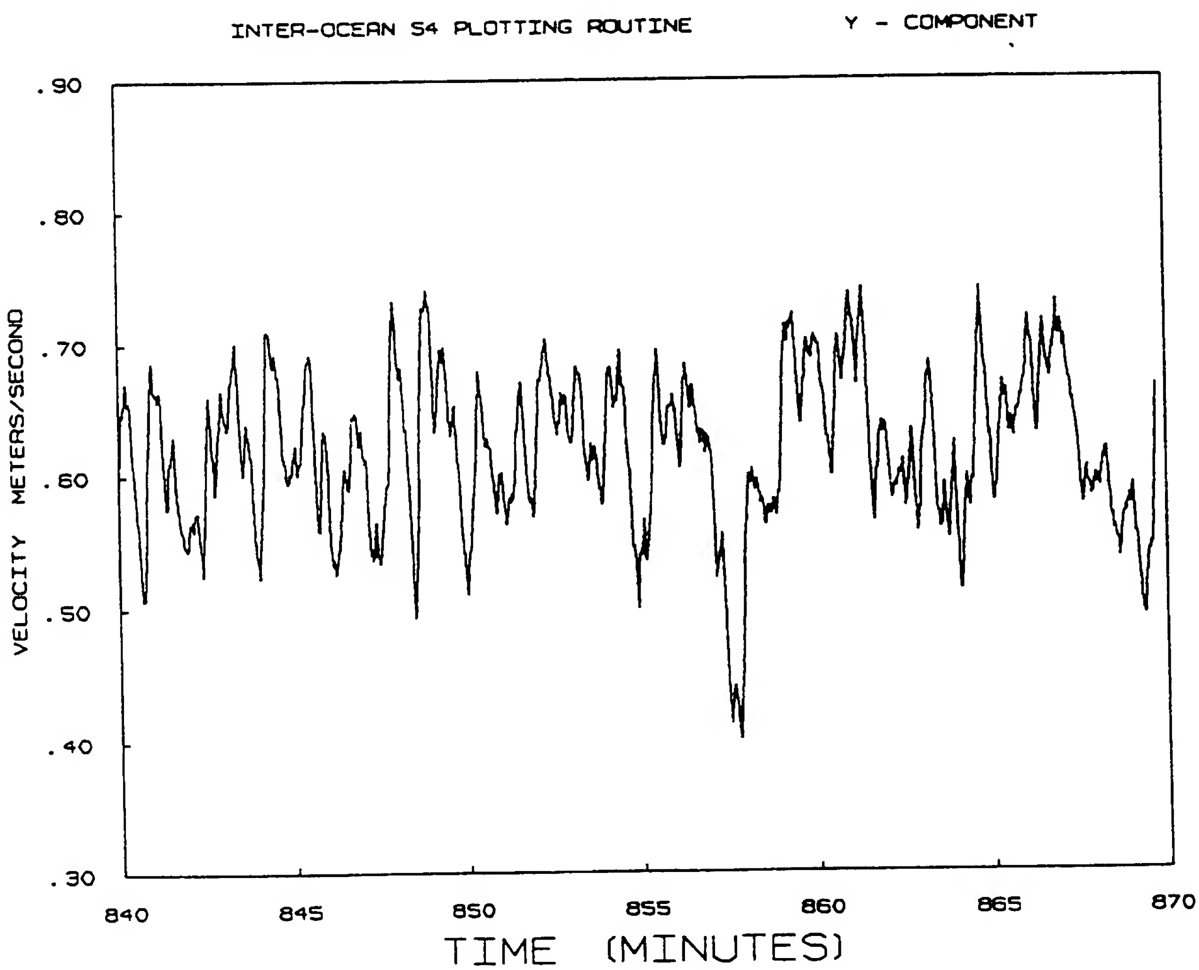
meter number	071	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN = 0.04	
speed	9.1 mph	VMAX = 0.14	TMAX = 866.
direction	downstream	VMIN = -0.04	TMIN = 846.



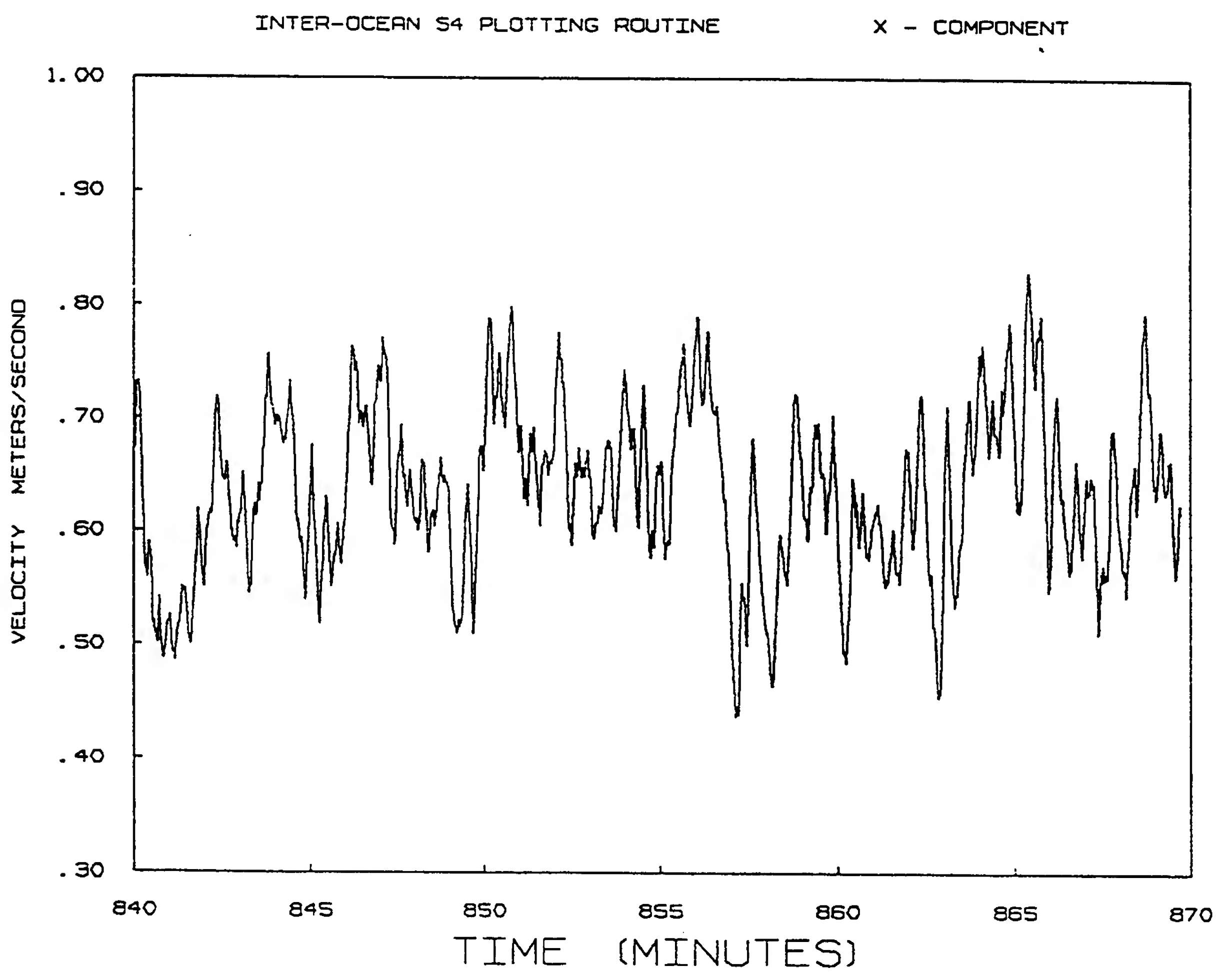
meter number	834	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN =	0.43
speed	9.1 mph	VMAX =	0.54 TMAX = 861.
direction	downstream	VMIN =	0.26 TMIN = 857.



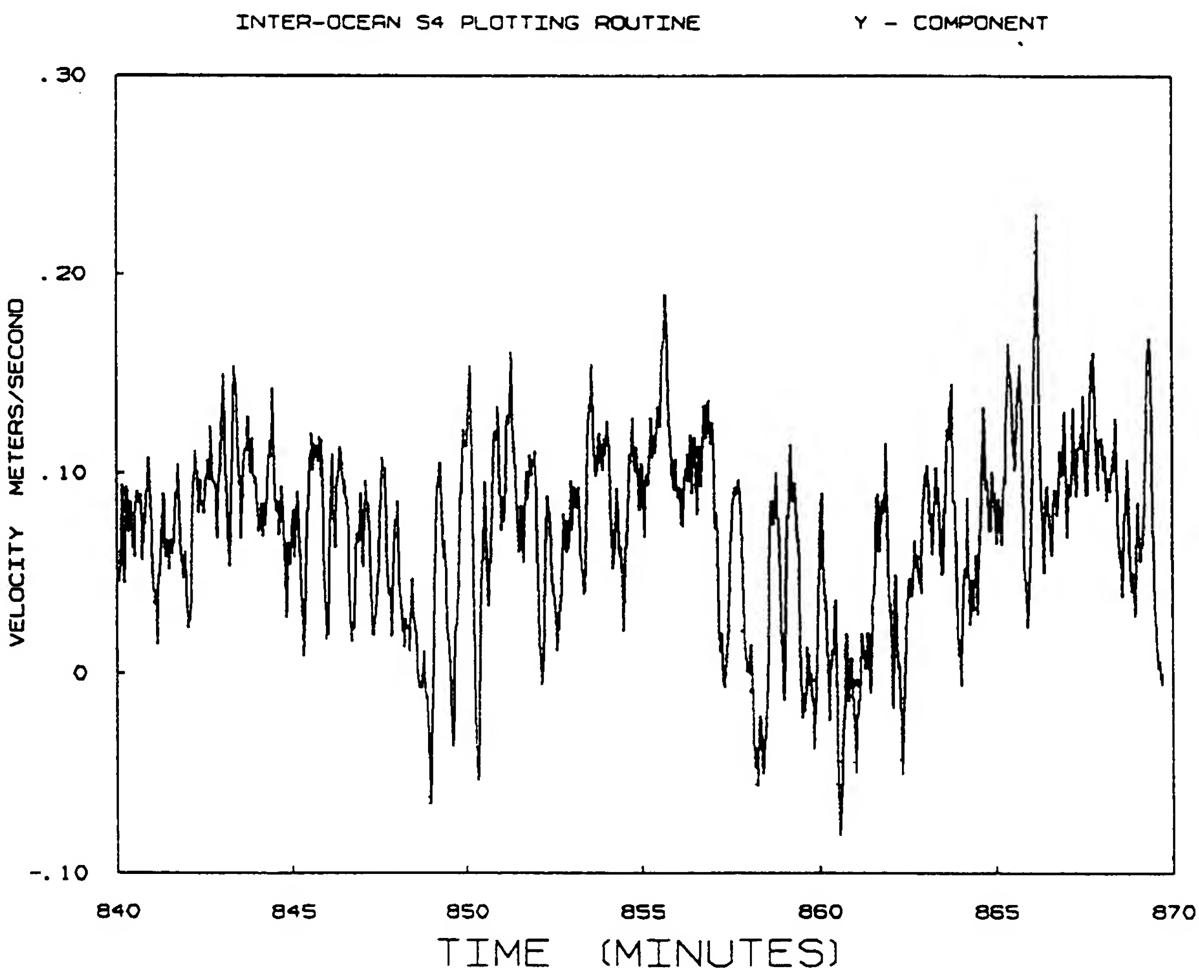
meter number	834	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN = 0.62	
speed	9.1 mph	VMAX = 0.74	TMAX = 861.
direction	downstream	VMIN = 0.40	TMIN = 858.



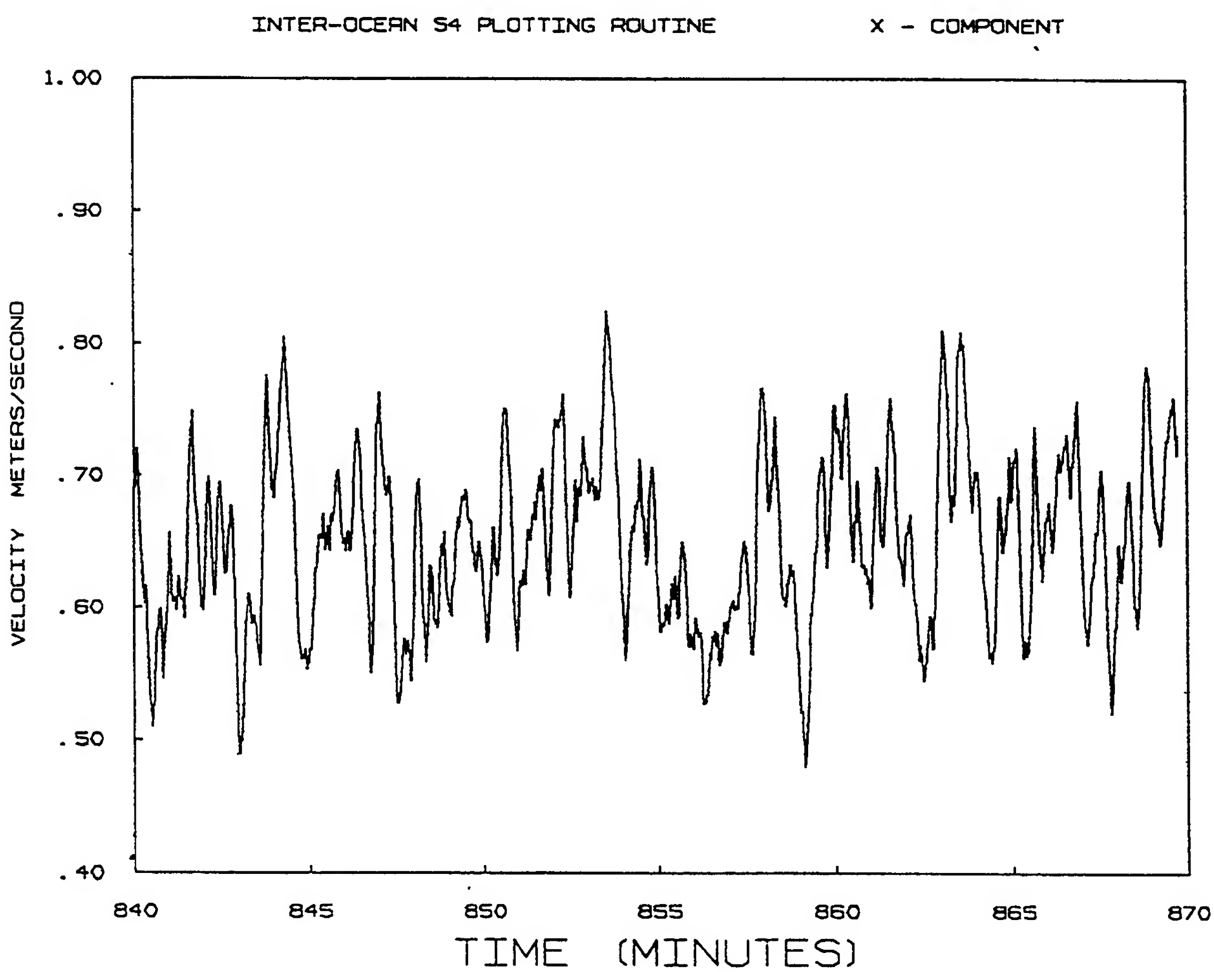
meter number	040	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN =	0.62
speed	9.1 mph	VMAX =	0.83 TMAX = 865.
direction	downstream	VMIN =	0.44 TMIN = 857.



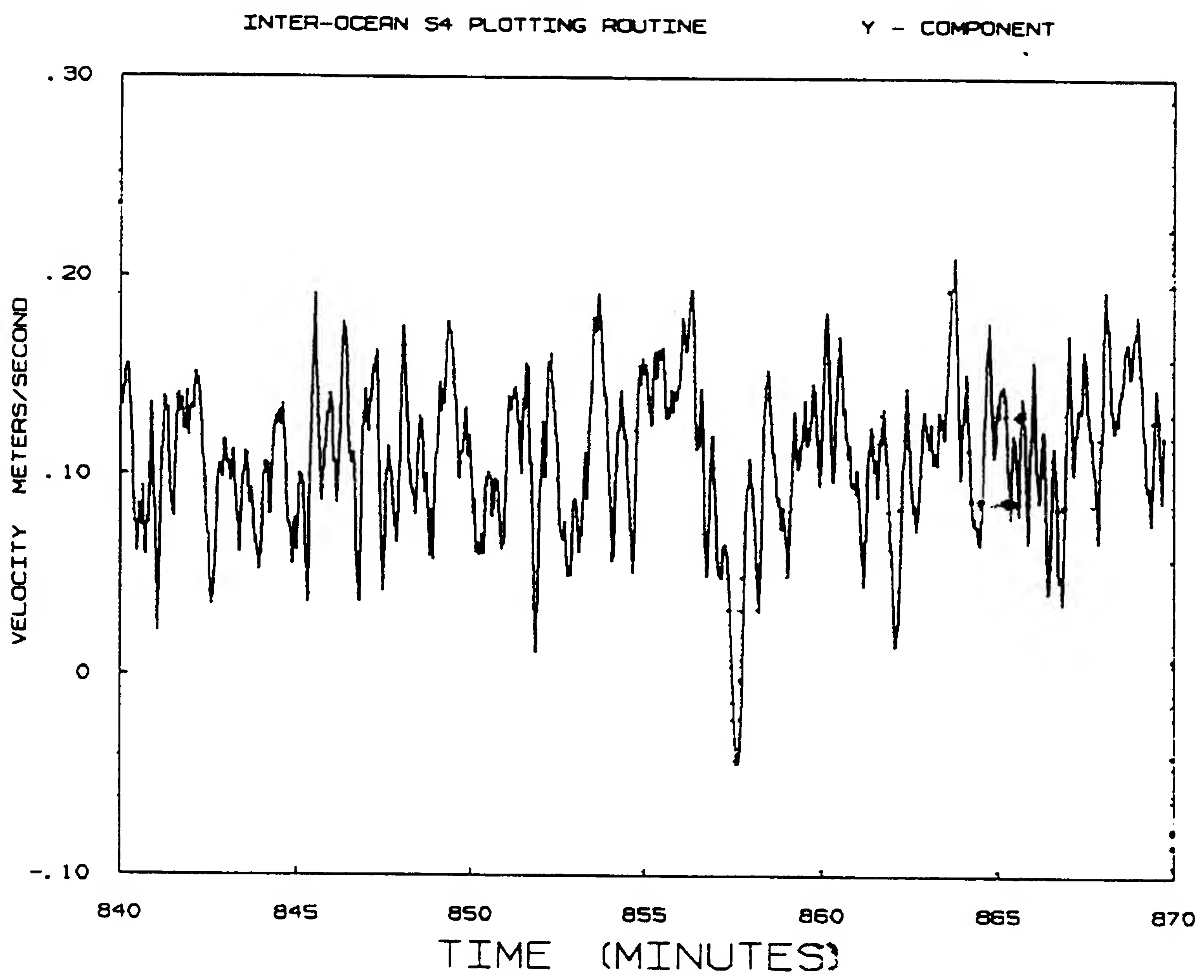
meter number	040	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN = 0.07	
speed	9.1 mph	VMAX = 0.23	TMAX = 866.
direction	downstream	VMIN = -0.08	TMIN = 861.



meter number	151	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN =	0.64
speed	9.1 mph	VMAX =	0.82 TMAX = 854.
direction	downstream	VMIN =	0.48 TMIN = 859.



meter number	151	distance	310
tow name	james F.	start-time	1400
configuration	3x5	end-time	1430
draft	9.0	MEAN = 0.11	
speed	9.1 mph	VMAX = 0.21	TMAX = 864.
direction	downstream	VMIN = −0.04	TMIN = 858.



XX-7. Velocity fluctuations measured by two-dimensional current meters for barge *Irving Crown* at Kampsville, trip 2

Irving Crown (8/14/91)

Status of Electromagnetic Current Meters:

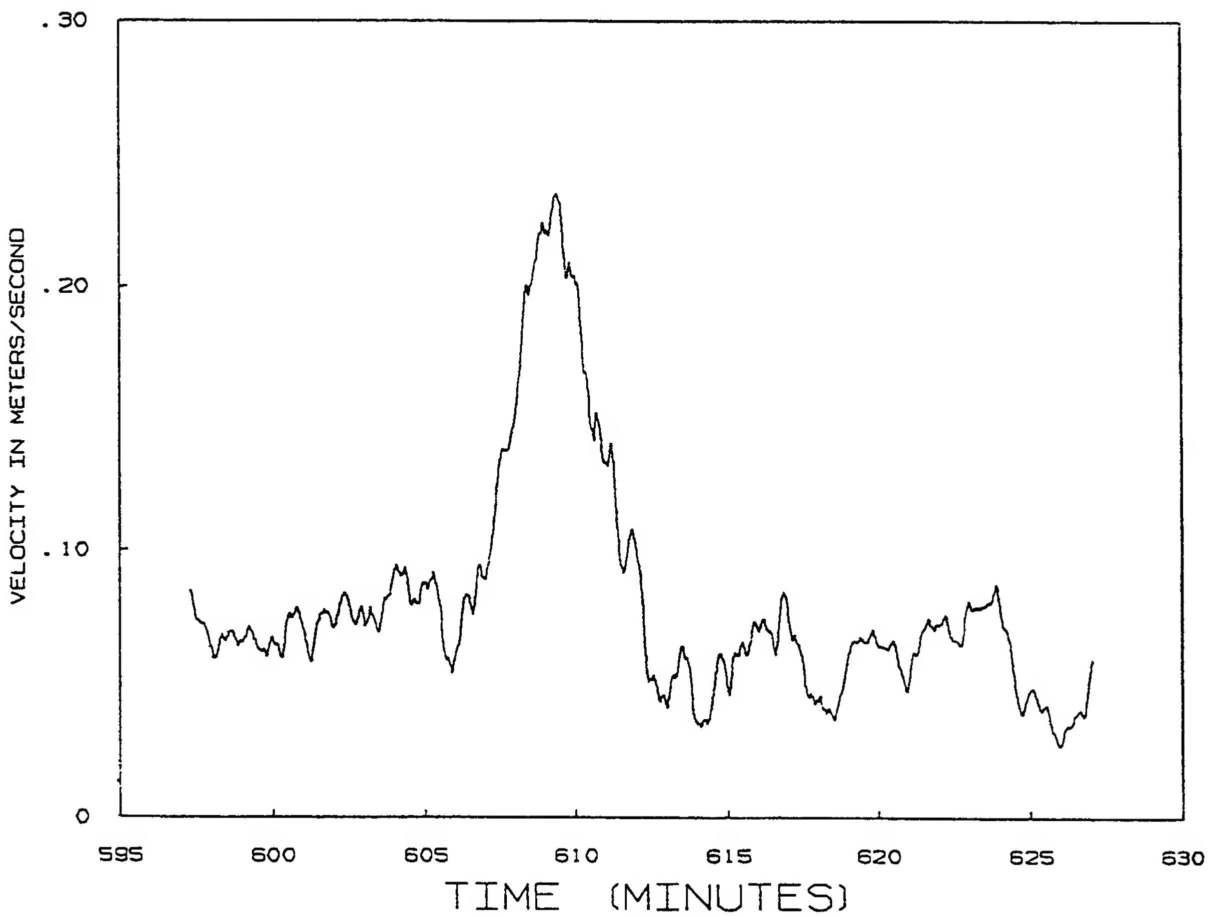
1001 (MMB511)	998 (MMB511)	999 (MMB511)	1000 (MMB511)
√	√	√	*

332 (MMB527)	642 (MMB527)
√	√

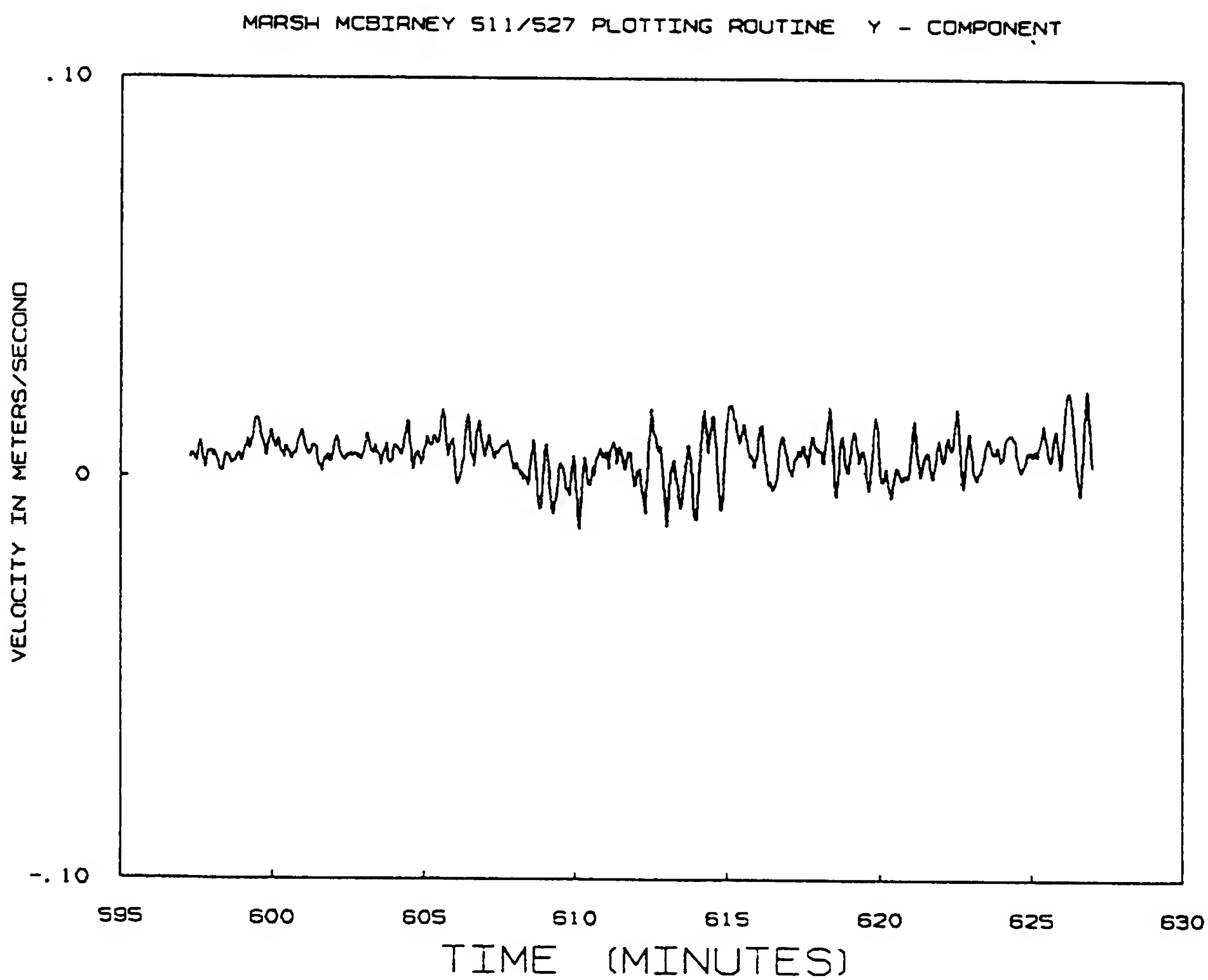
Note: √ : Working
* : Not working

meter number	511-1001	start-time	0955
tow name	Icrown	end-time	1025
configuration	2x2 + 3	mean =	0.07
draft	9.0	vmax = 0.00	tmax = 609.
speed	3.6 mph	vmin = 0.00	tmin = 626.
direction	upstream		
distance	722		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

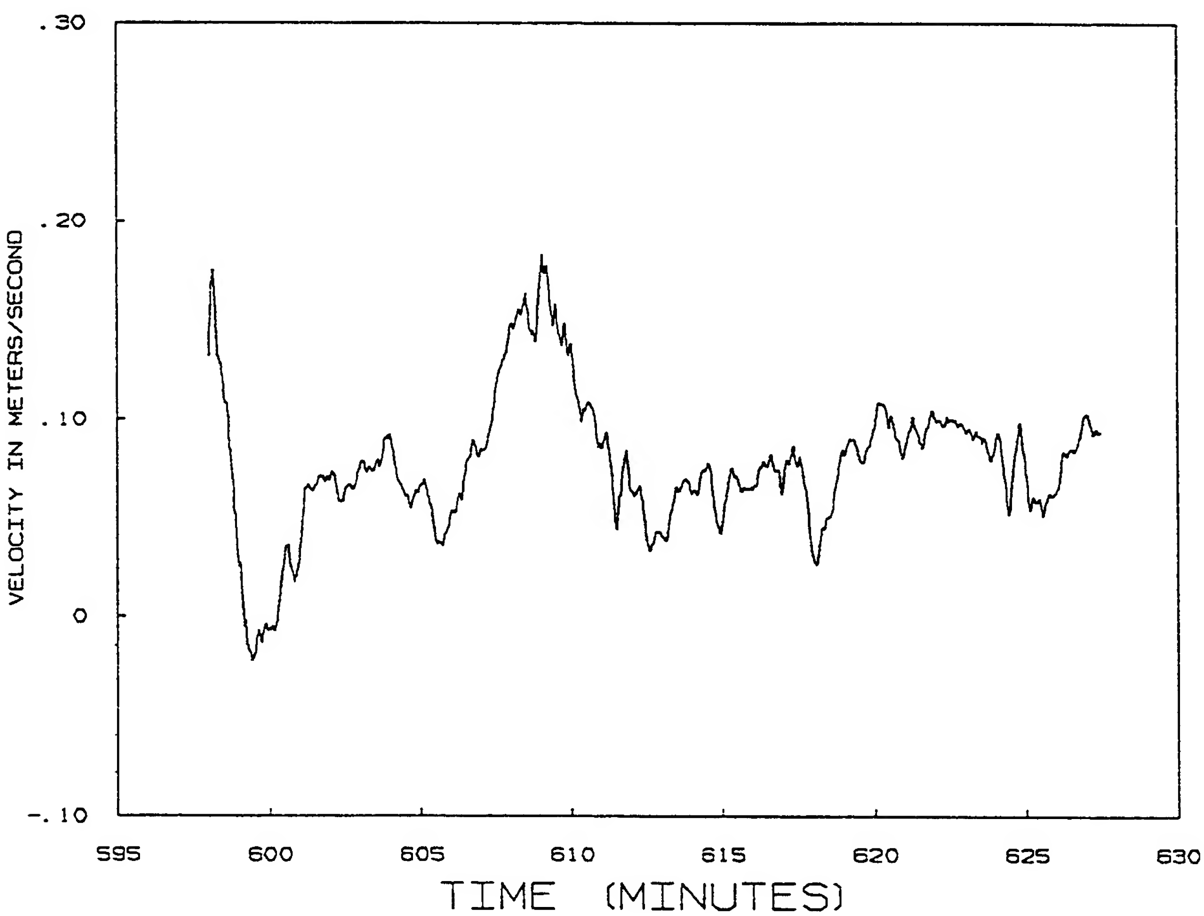


meter number	511-1001	start-time	0955
tow name	lcrown	end-time	1025
configuration	2x2 + 3	mean =	0.01
draft	9.0	vmax =	0.00 tmax = 627.
speed	3.6 mph	vmin =	0.00 tmin = 610.
direction	upstream		
distance	722		



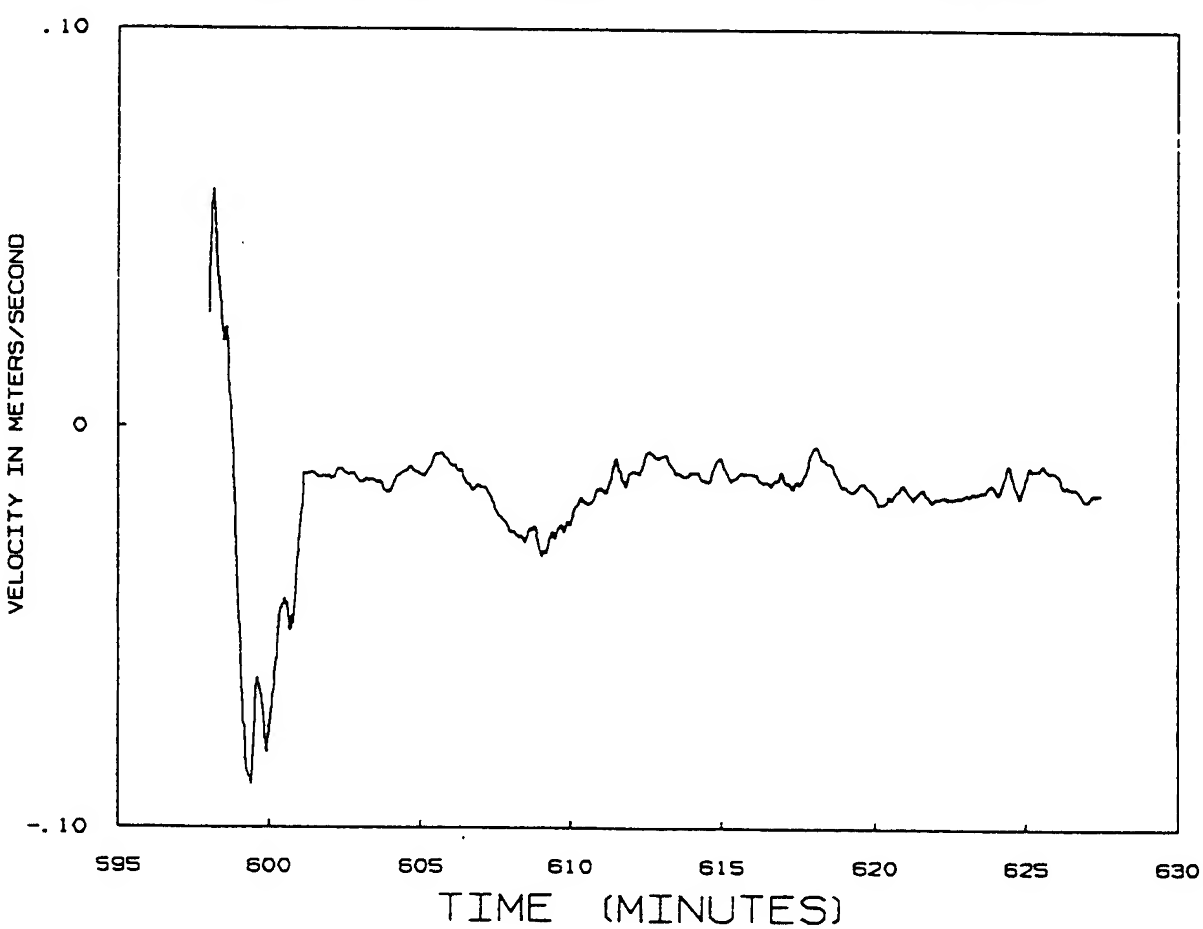
meter number	998	distance	722		
tow name	Icrown	start-time	0958		
configuration	2x2 + 3	end-time	1028		
draft	9.0	mean =	0.06		
speed	3.6 mph	vmax =	0.18	tmax =	609.
direction	upstream	vmin =	-0.02	tmin =	599.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

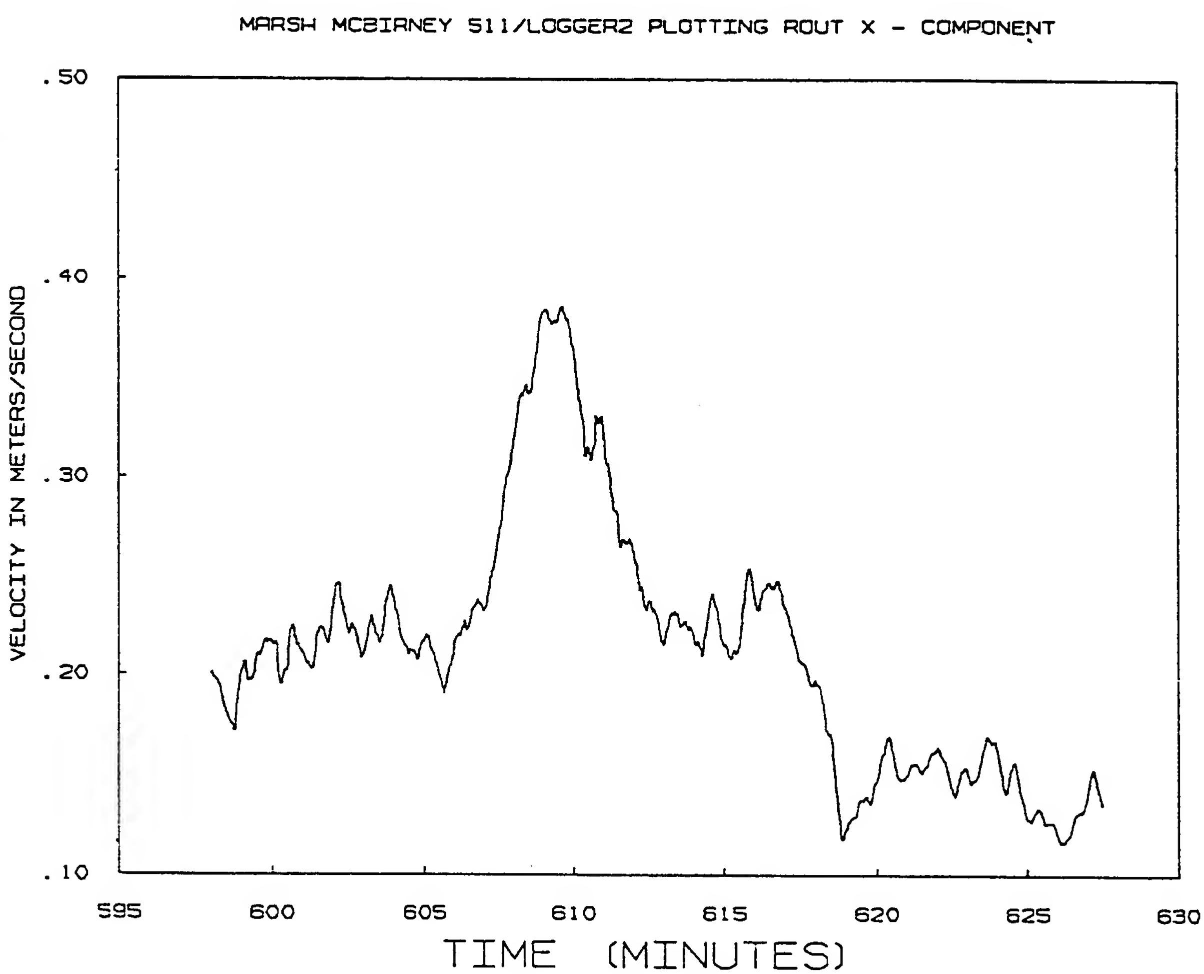


meter number	998	distance	722
tow name	Icrown	start−time	0958
configuration	2x2 + 3	end−time	1028
draft	9.0	mean = −0.02	
speed	3.6 mph	vmax = 0.06	tmax = 598.
direction	upstream	vmin = −0.09	tmin = 599.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

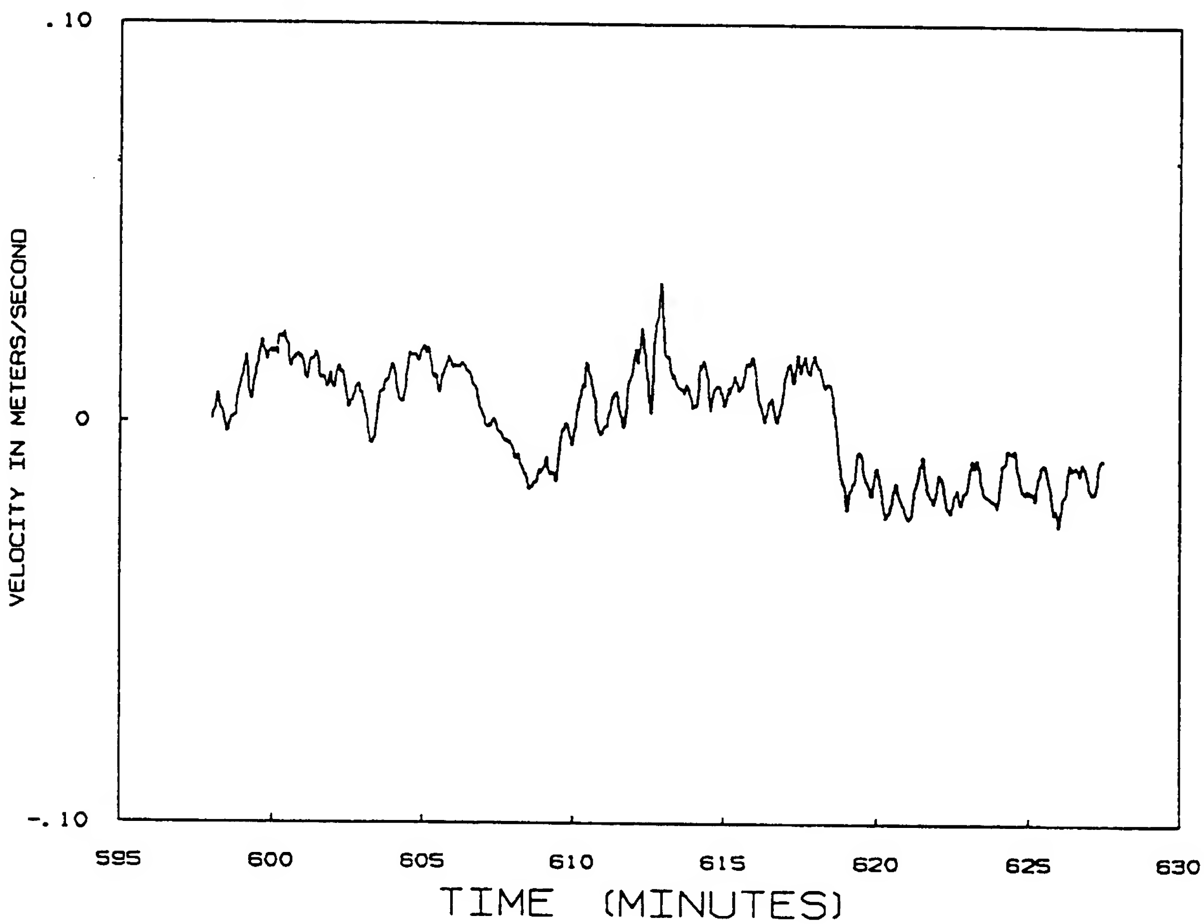


meter number	999	distance	722
tow name	Icrown	start-time	0958
configuration	2x2 + 3	end-time	1028
draft	9.0	mean =	0.22
speed	3.6 mph	vmax =	0.39 tmax = 610.
direction	upstream	vmin =	0.12 tmin = 626.



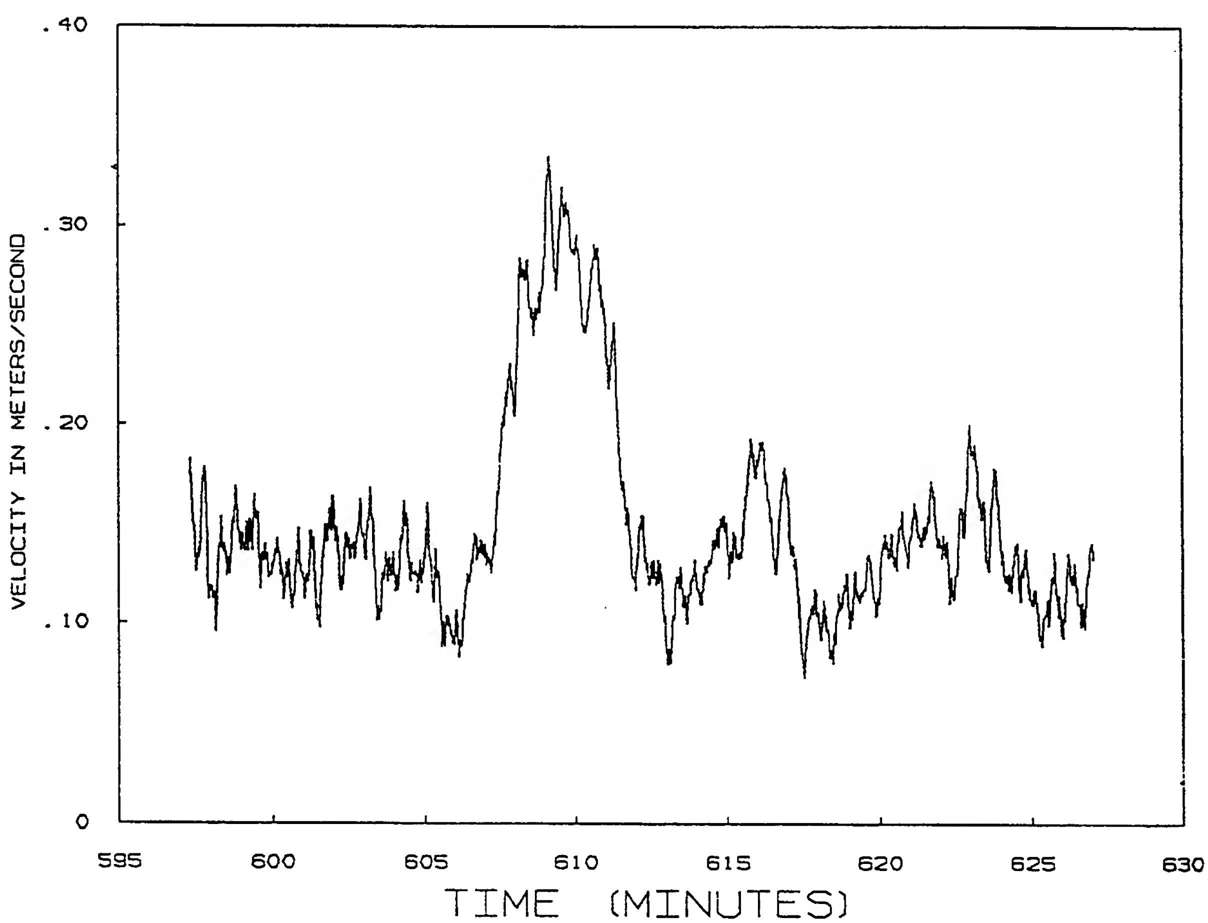
meter number	999	distance	722
tow name	Icrown	start-time	0958
configuration	2x2 + 3	end-time	1028
draft	9.0	mean =	0.01
speed	3.6 mph	vmax =	0.04 tmax = 613.
direction	upstream	vmin =	-0.03 tmin = 626.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



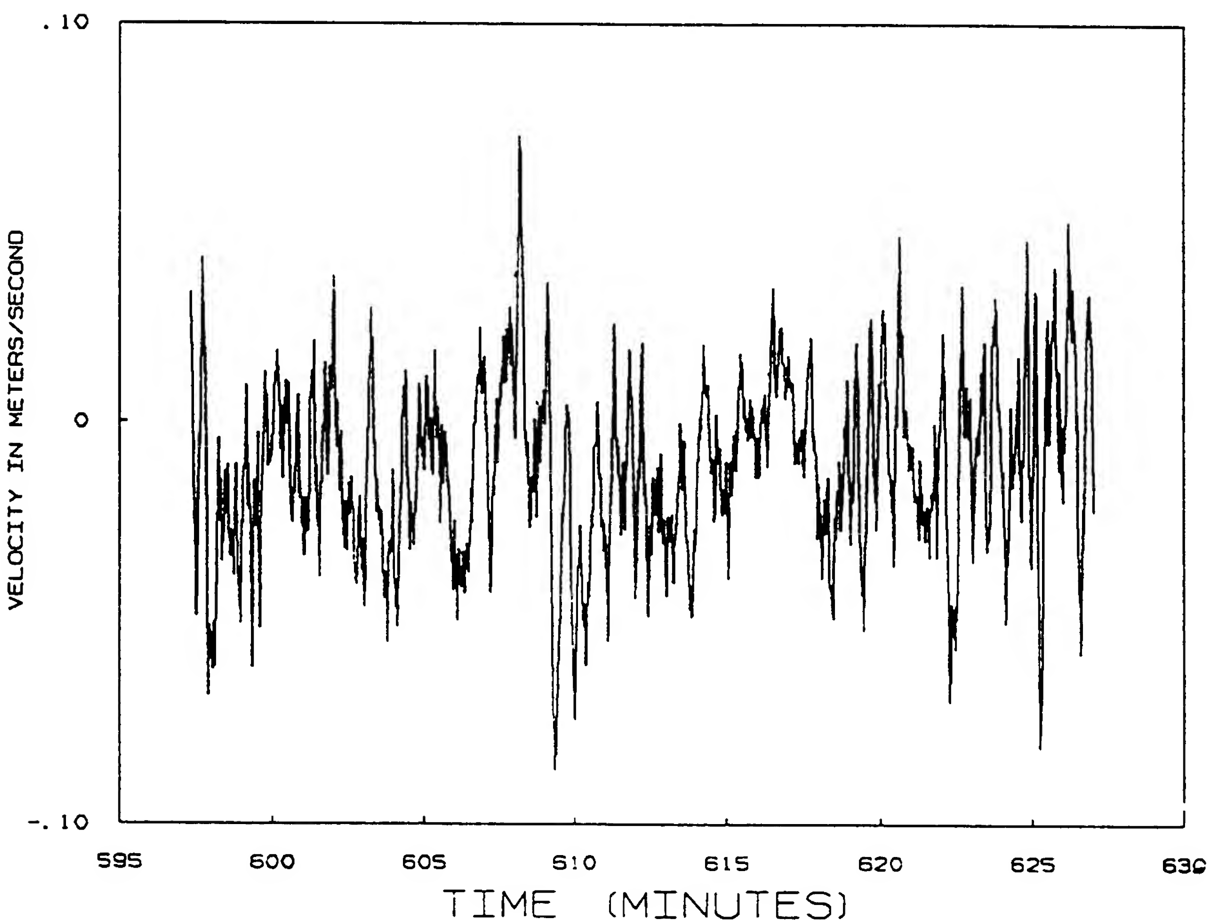
meter number	B-642	start-time	0955
tow name	Icrown	end-time	1025
configuration	2x2 + 3	mean =	0.13
draft	9.0	vmax =	0.00 tmax = 609.
speed	3.6 mph	vmin =	0.00 tmin = 618.
direction	upstream		
distance	722		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



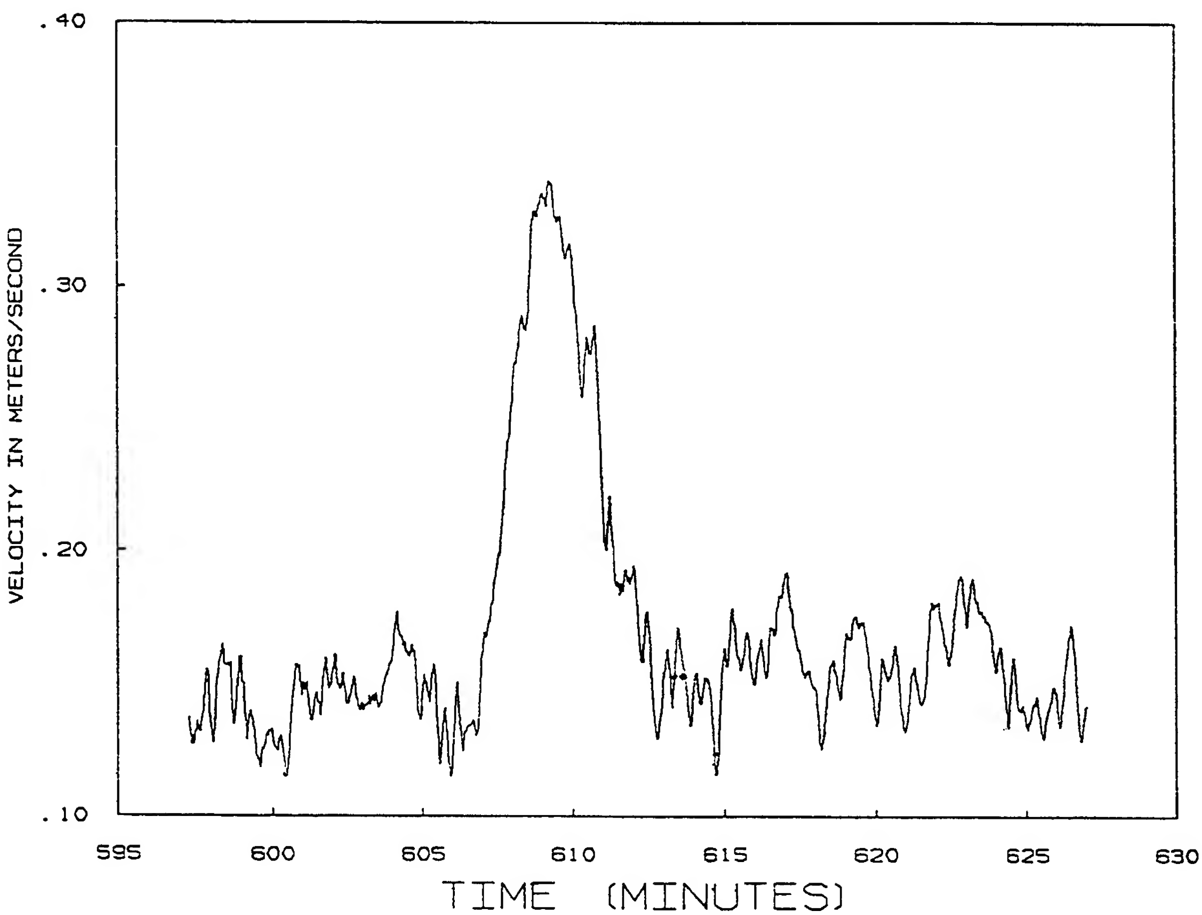
meter number	B-642	start-time	0955
tow name	Icrown	end-time	1025
configuration	2x2 + 3	mean = -0.02	
draft	9.0	vmax = 0.00	tmax = 608.
speed	3.6 mph	vmin = 0.00	tmin = 609.
direction	upstream		
distance	722		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



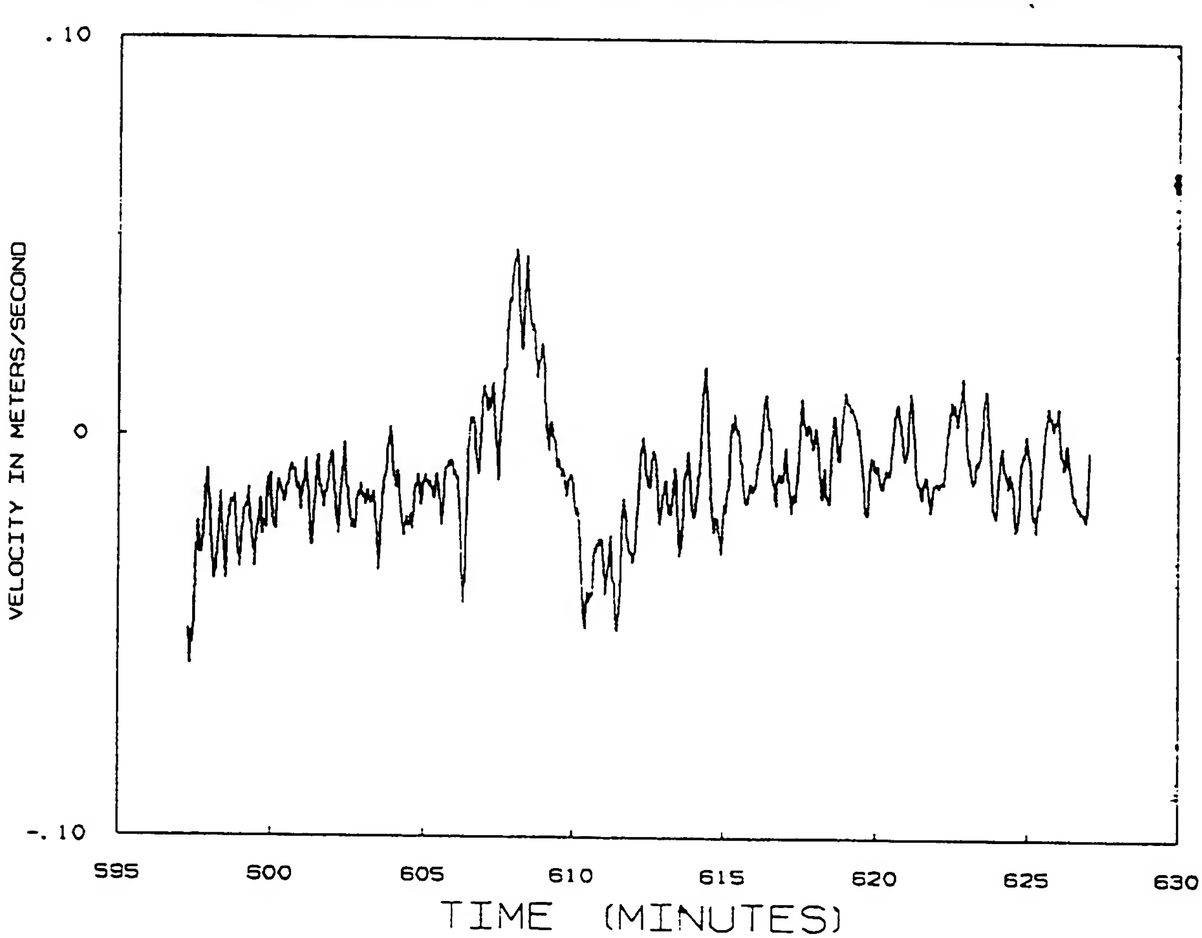
meter number	B-332	start-time	0955
tow name	Icrown	end-time	1025
configuration	2x2 + 3	mean =	0.14
draft	9.0	vmax = 0.00	tmax = 609.
speed	3.6 mph	vmin = 0.00	tmin = 600.
direction	upstream		
distance	722		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT



meter number	B-332	start-time	0955
tow name	Icrown	end-time	1025
configuration	2x2 + 3	mean = -0.02	
draft	9.0	vmax = 0.00	tmax = 608.
speed	3.6 mph	vmin = 0.00	tmin = 597.
direction	upstream		
distance	722		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE Y - COMPONENT



XX-8. Velocity fluctuations measured by two-dimensional current meters for barge *Jack Bullard* at Clarks Ferry, trip 2

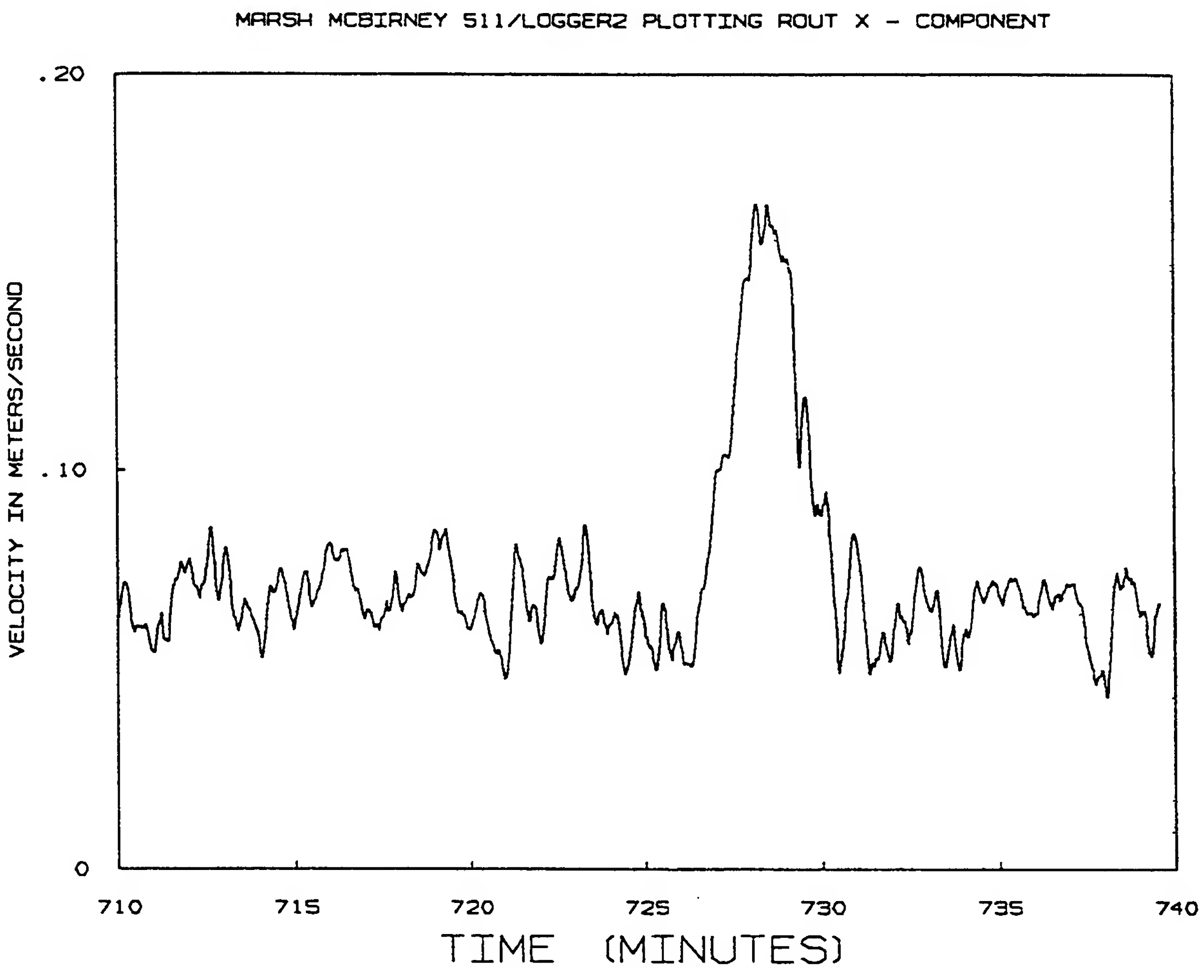
Jack Bullard (10/19/91)

Status of Electromagnetic Current Meters:

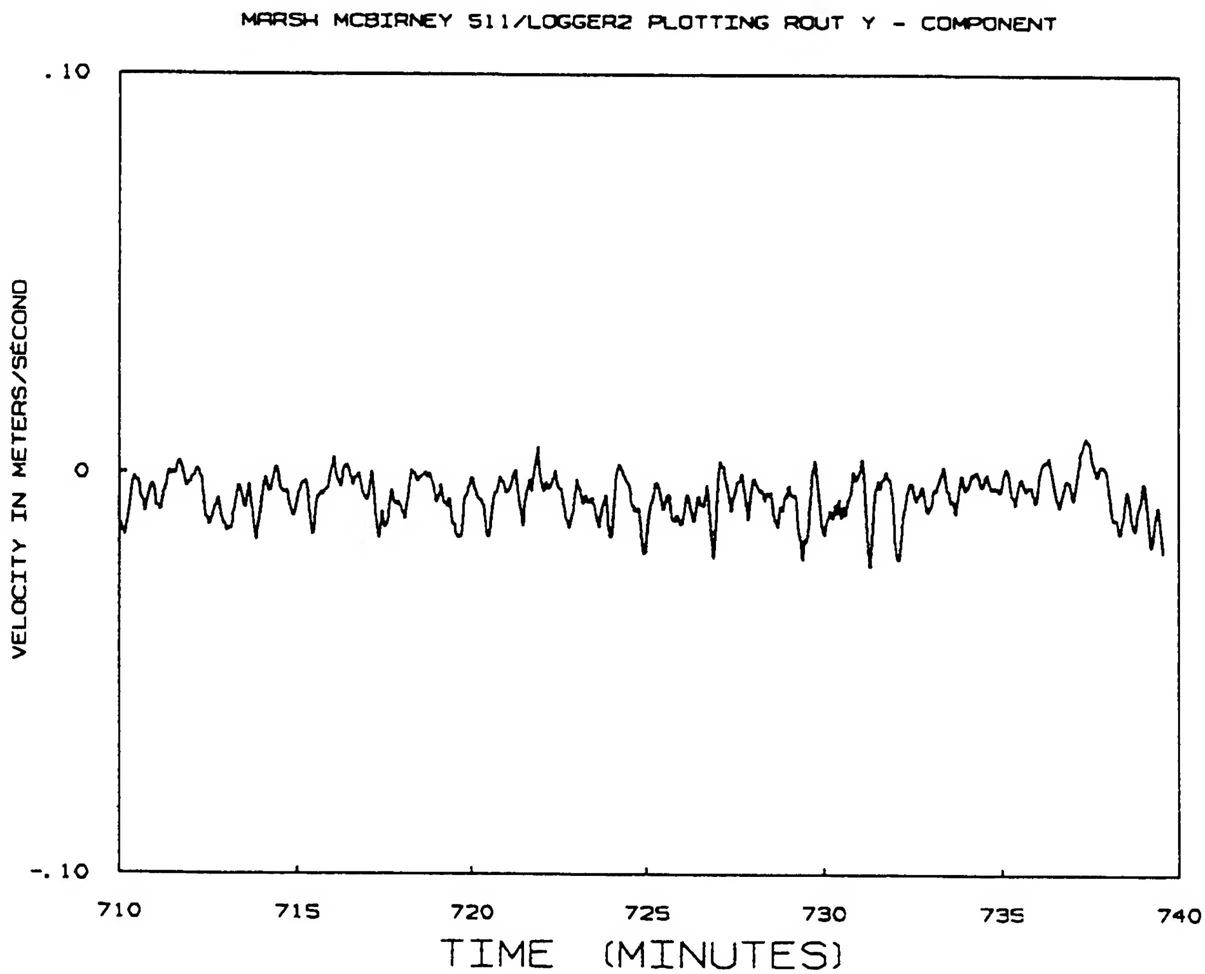
1001	998	999	1000	1330	1331
(MMB511)	(MMB511)	(MMB511)	(MMB511)	(MMB511)	(MMB511)
√	√	√	√	√	√
834	151	832	040		
(S4)	(S4)	(S4)	(S4)		
√	√	*	√		
332	642				
(MMB527)	(MMB527)				
√	√				

Note: √ : Working
* : Not working
- : Not available

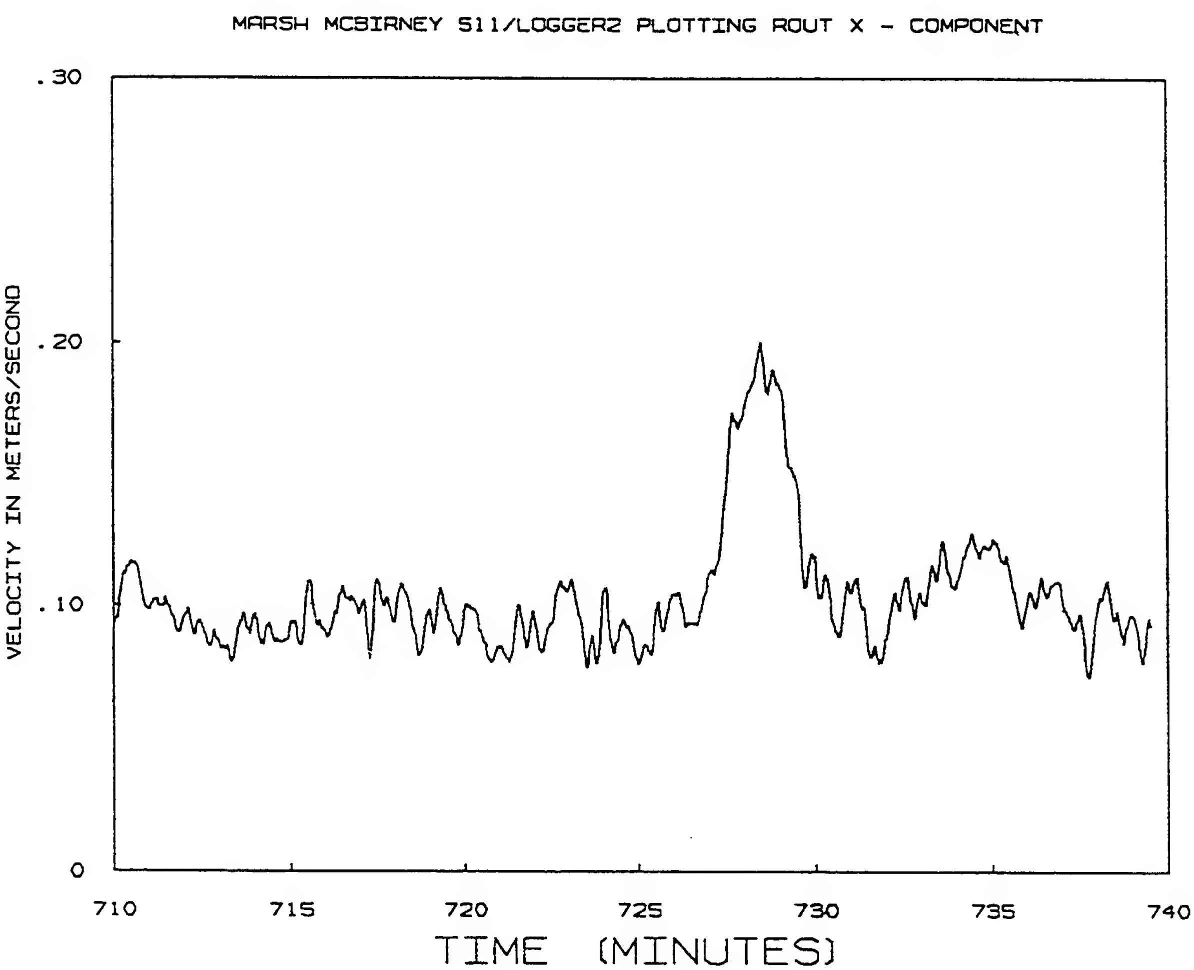
meter number	1001	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean = 0.07	
speed	5.3 mph	vmax = 0.17	tmax = 728.
direction	upstream	vmin = 0.04	tmin = 738.



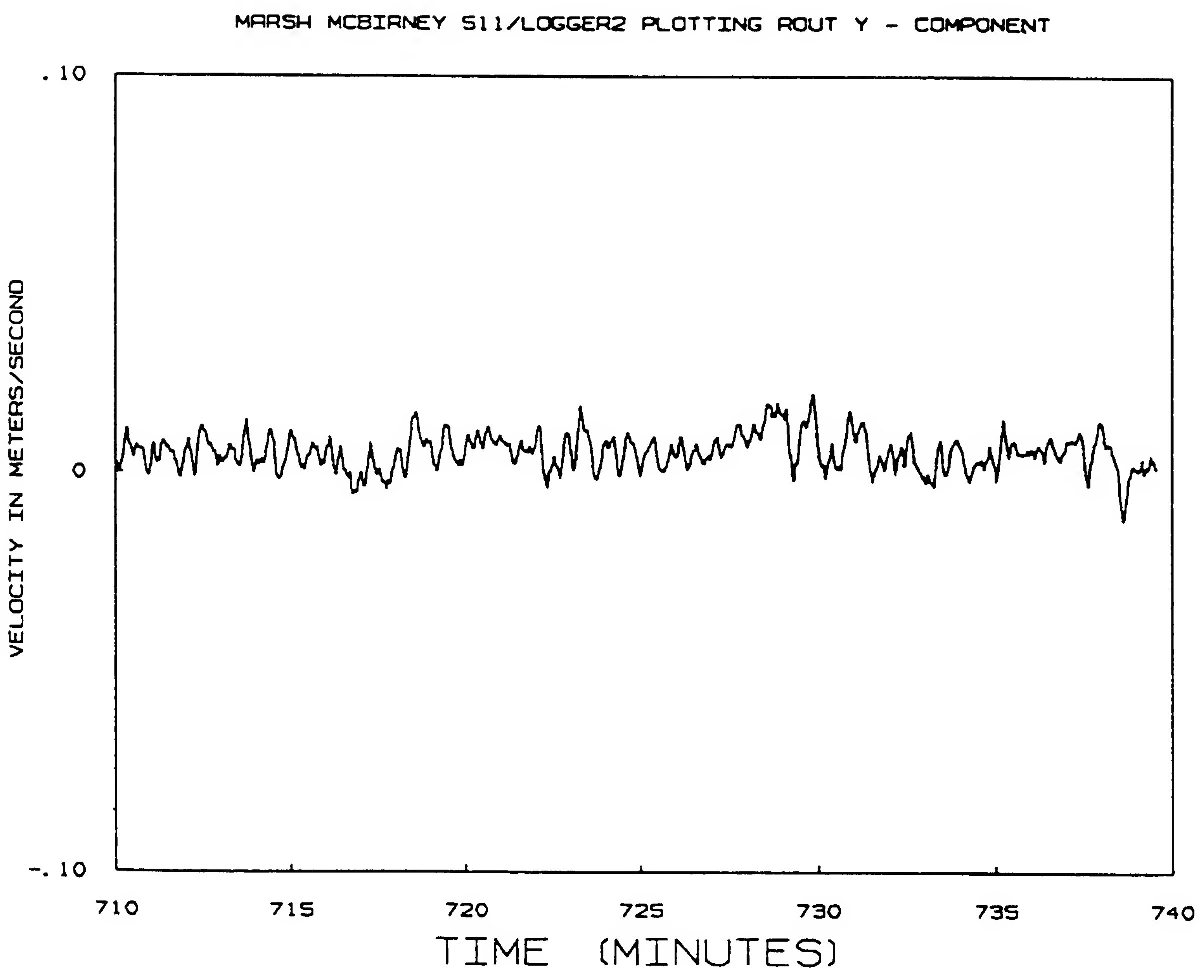
meter number	1001	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean = −0.01	
speed	5.3 mph	vmax = 0.01	tmax = 737.
direction	upstream	vmin = −0.02	tmin = 731.



meter number	998	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.10
speed	5.3 mph	vmax =	0.20 tmax = 729.
direction	upstream	vmin =	0.07 tmin = 738.

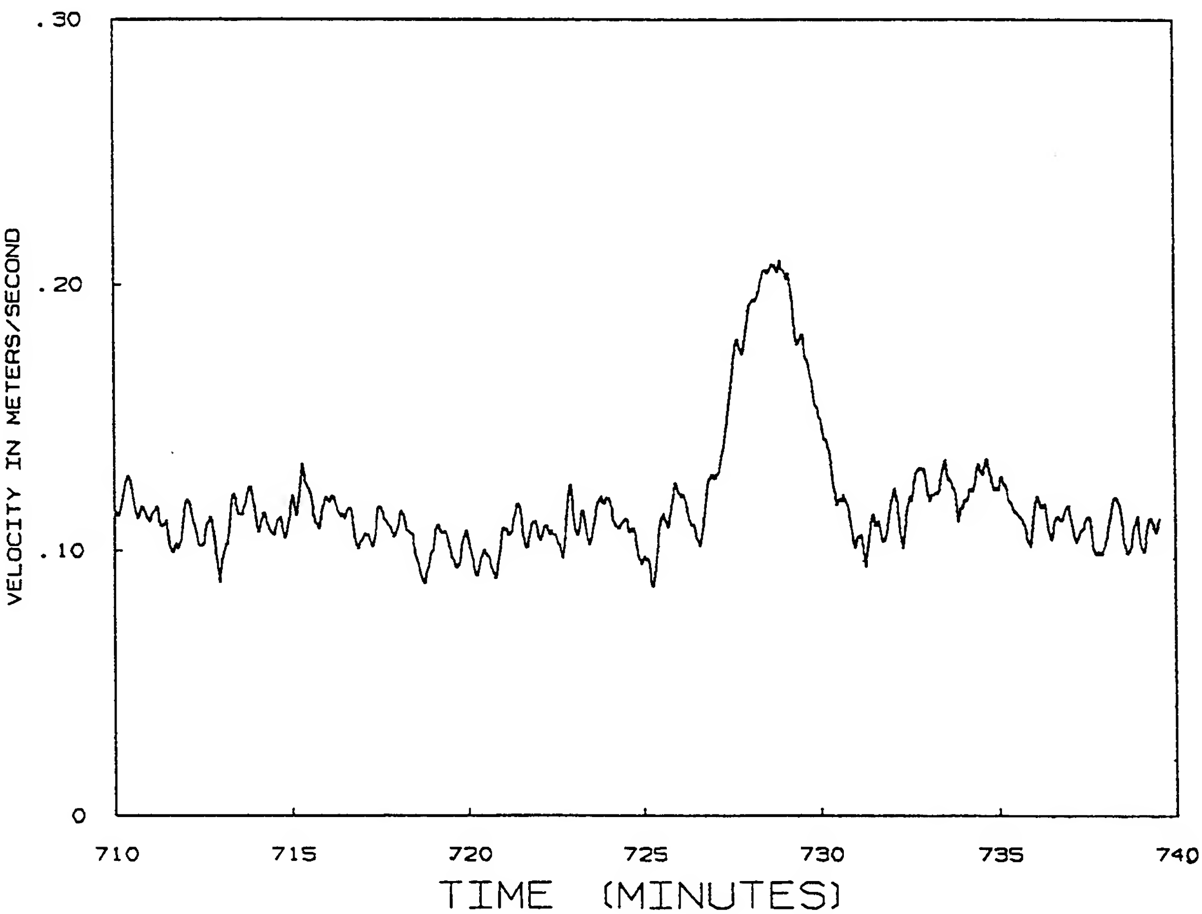


meter number	998	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.00
speed	5.3 mph	vmax =	0.02 tmax = 730.
direction	upstream	vmin =	-0.01 tmin = 739.



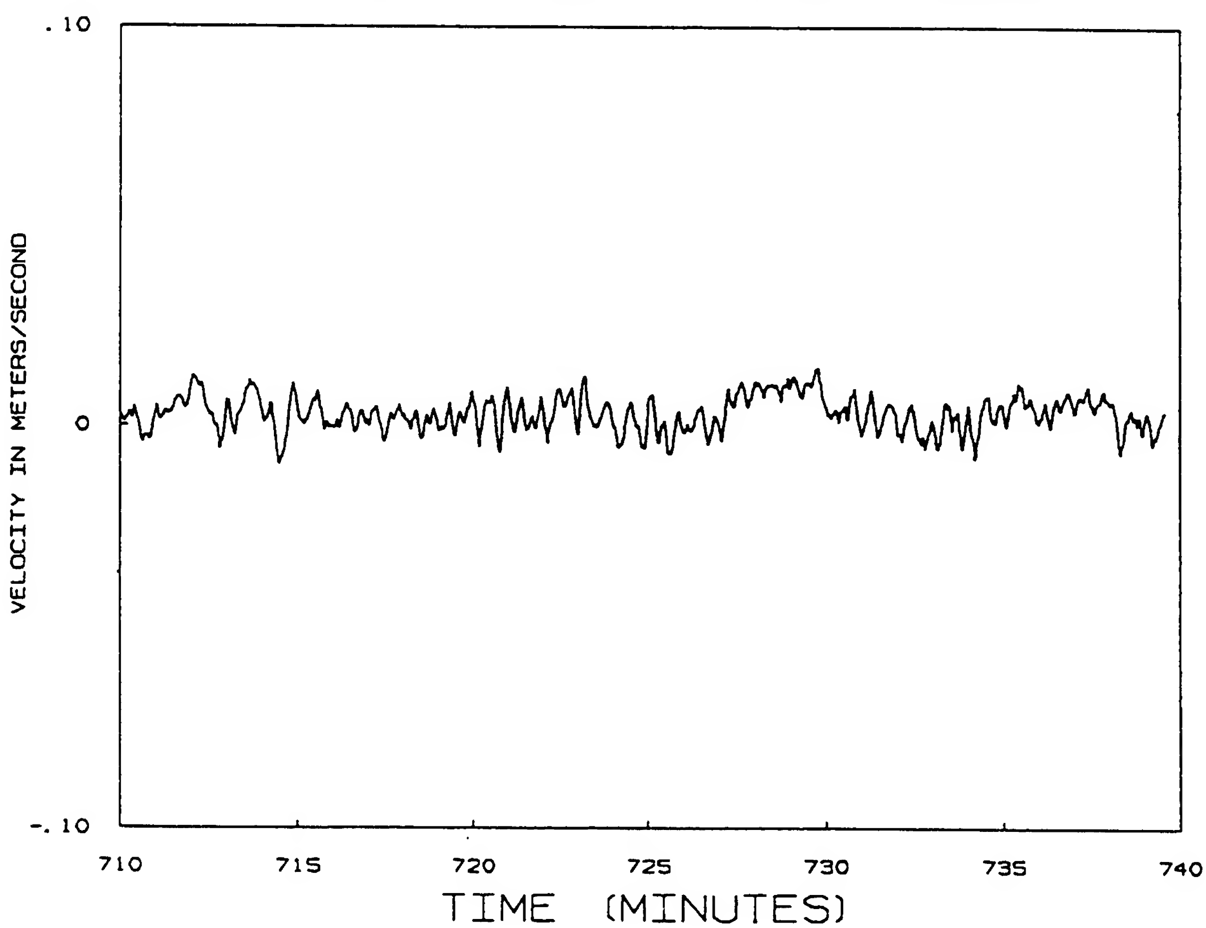
meter number	999	distance	215
tow name	Jack Bullard	start–time	1150
configuration	2x1+3x4	end–time	1220
draft	9.0	mean =	0.11
speed	5.3 mph	vmax =	0.21 tmax = 729.
direction	upstream	vmin =	0.09 tmin = 725.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT

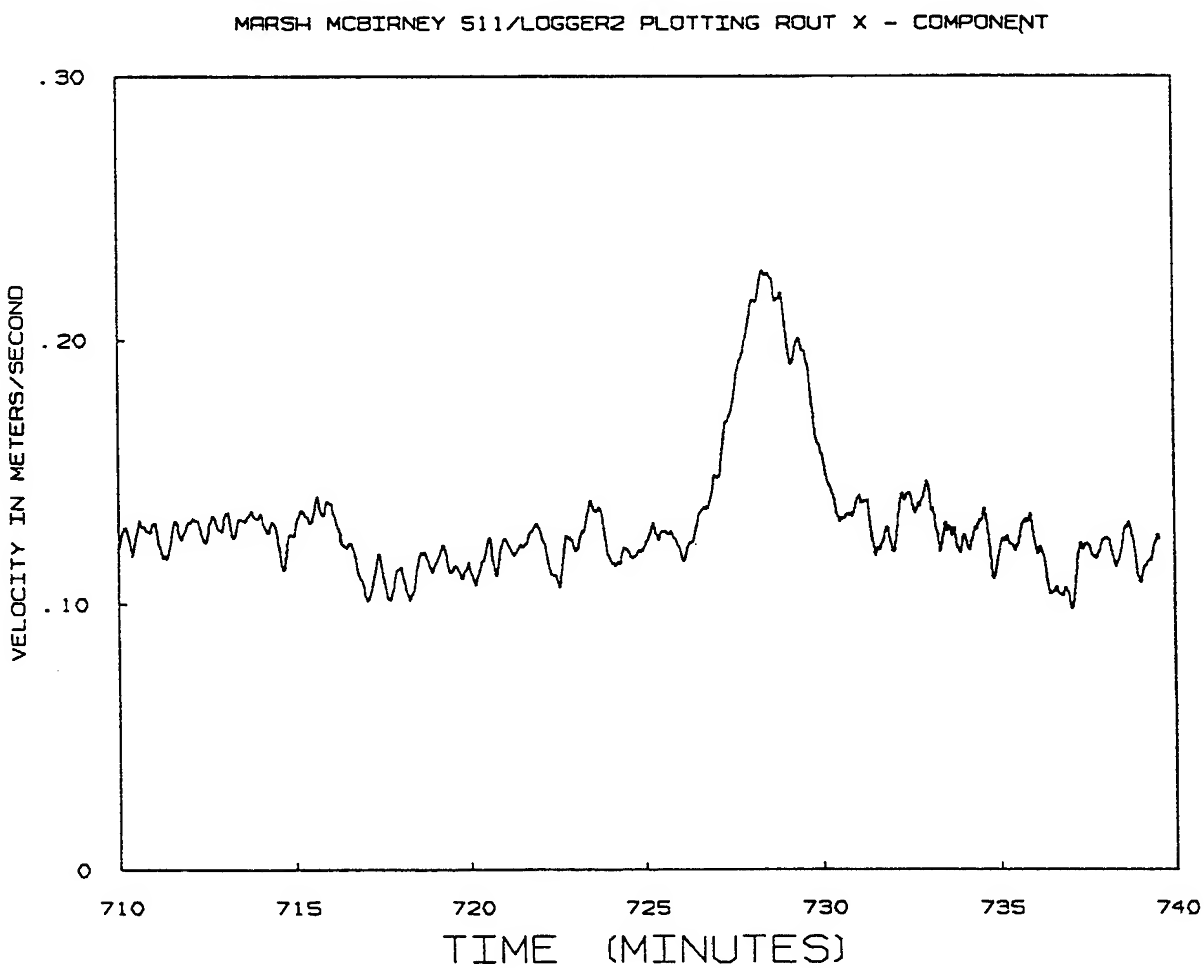


meter number	999	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.00
speed	5.3 mph	vmax =	0.01 tmax = 730.
direction	upstream	vmin =	-0.01 tmin = 714.

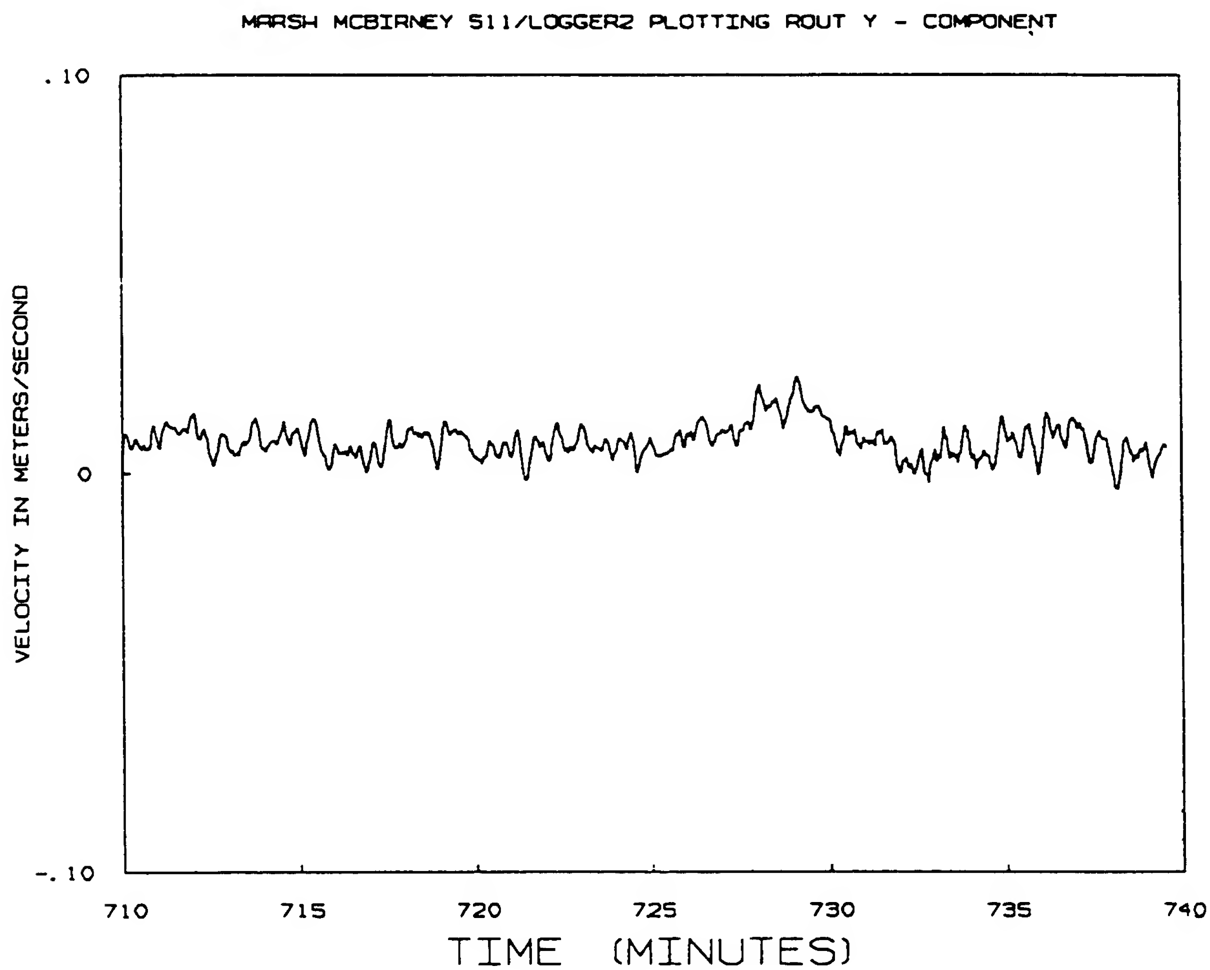
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT



meter number	1000	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.12
speed	5.3 mph	vmax =	0.23 tmax = 728.
direction	upstream	vmin =	0.10 tmin = 737.

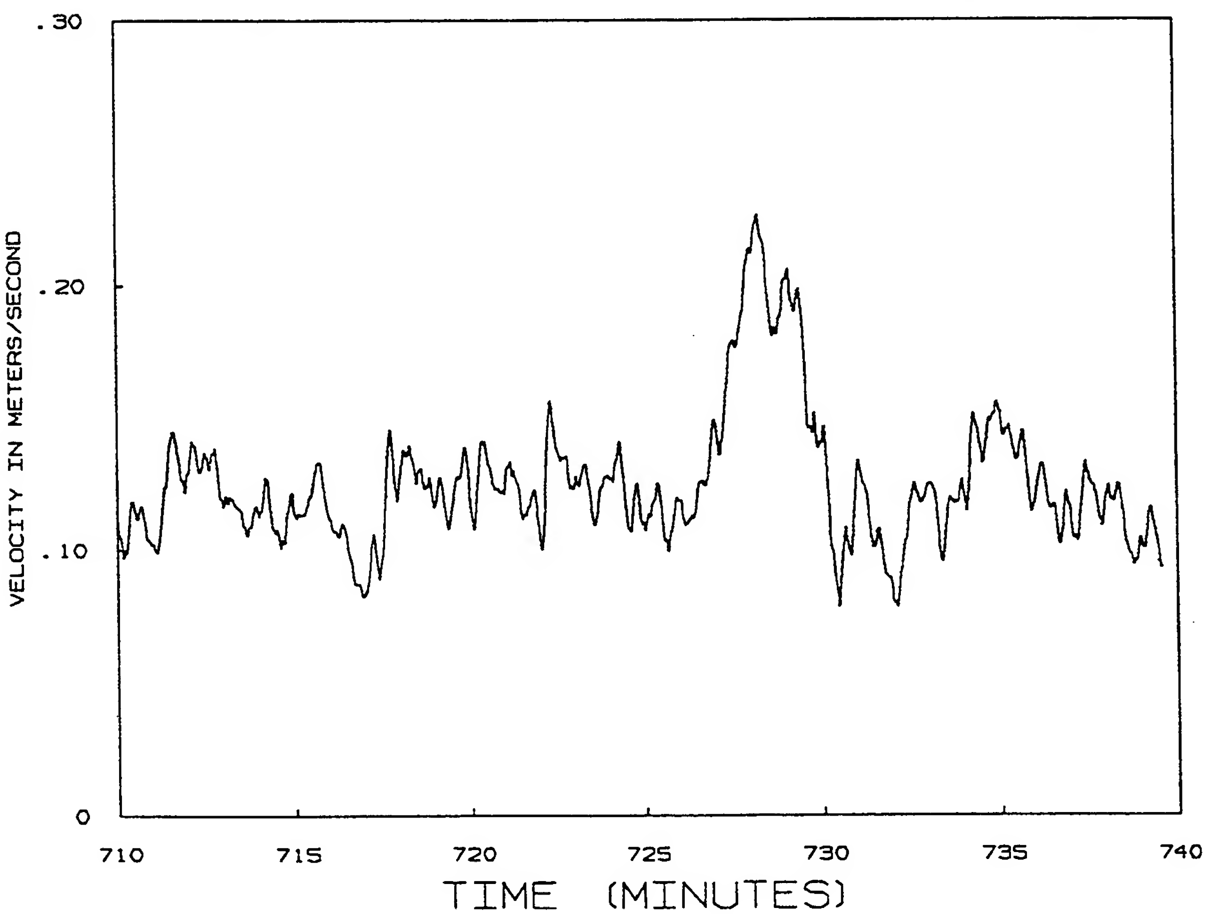


meter number	1000	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.01
speed	5.3 mph	vmax =	0.02 tmax = 729.
direction	upstream	vmin =	0.00 tmin = 738.



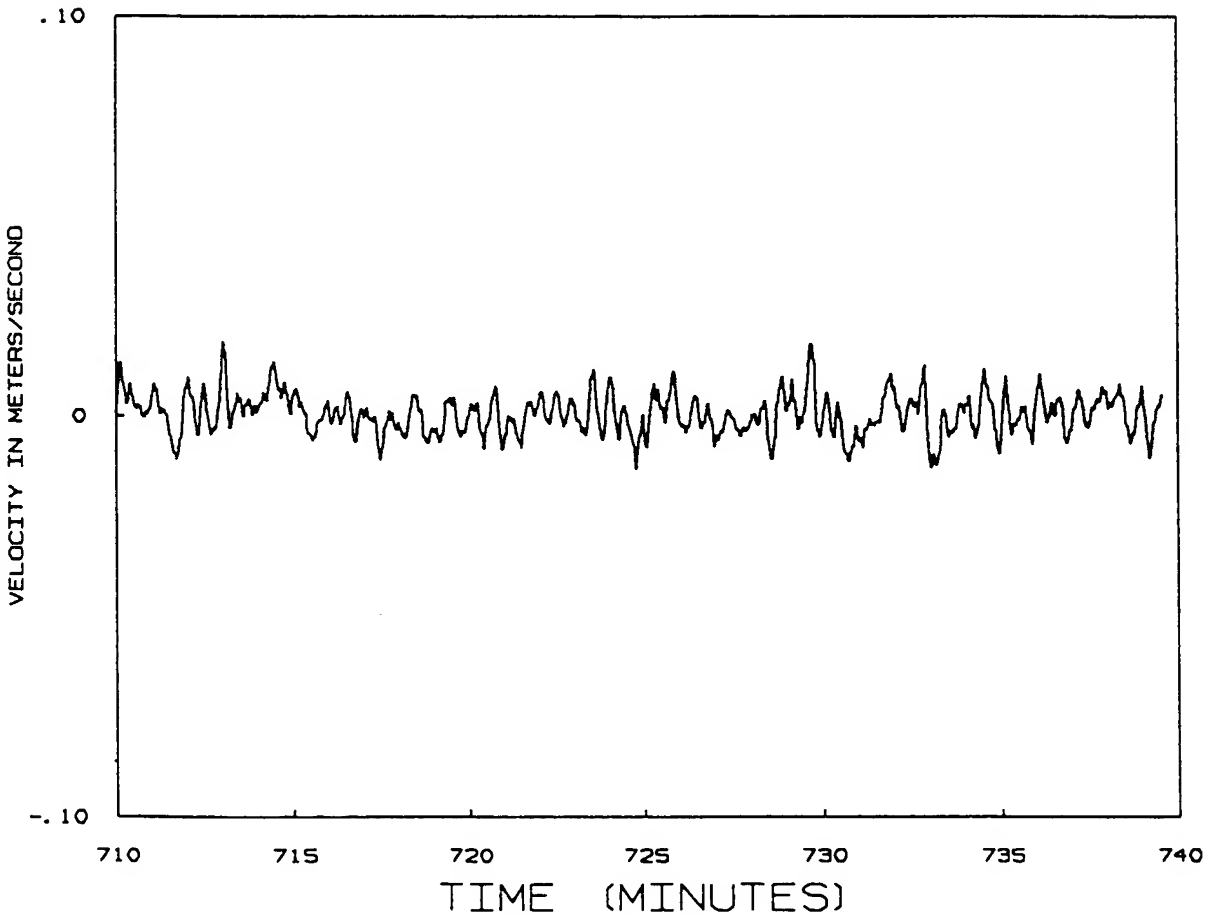
meter number	1130	distance	215			
tow name	Jack Bullard	start-time	1150			
configuration	2x1+3x4	end-time	1220			
draft	9.0	mean =	0.12			
speed	5.3 mph	vmax =	0.23	tmax	=	728.
direction	upstream	vmin =	0.08	tmin	=	732.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



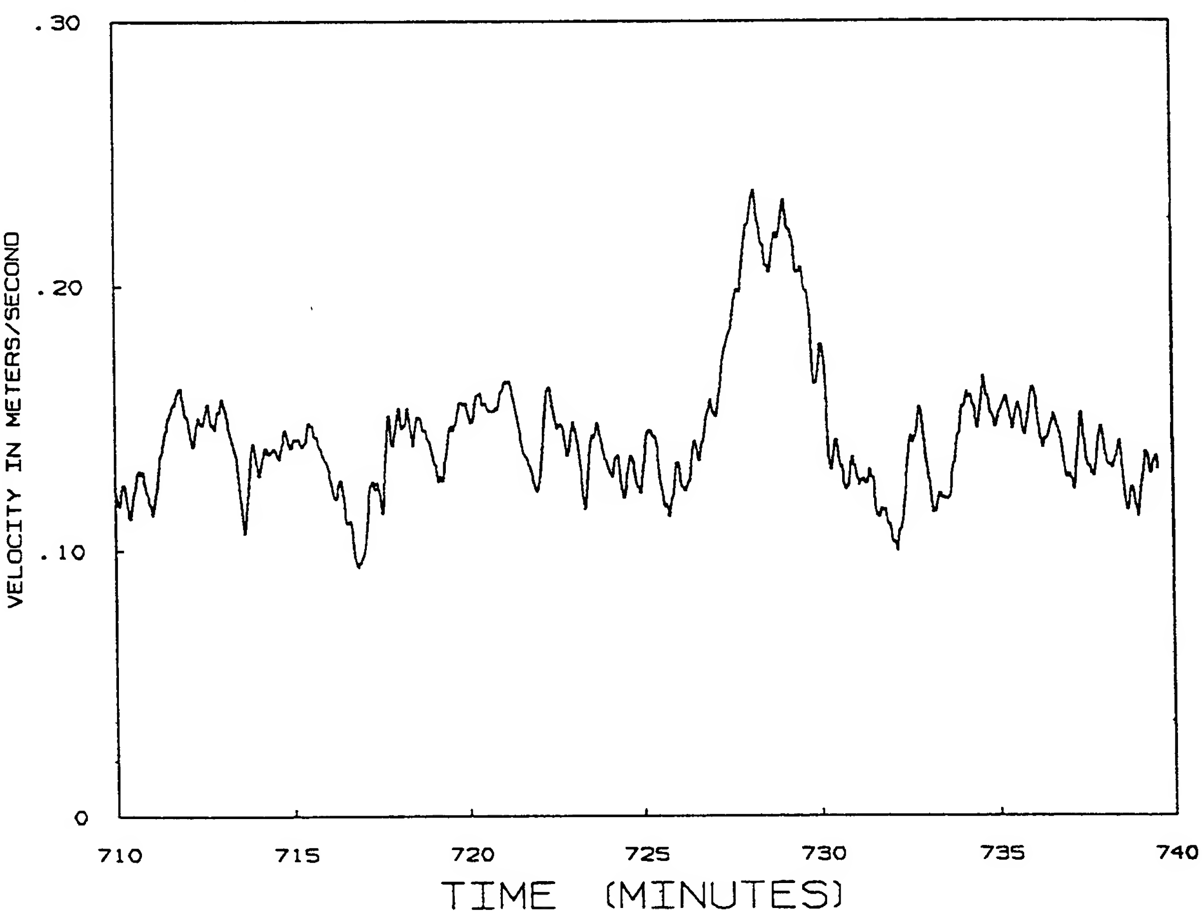
meter number	1130	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.00
speed	5.3 mph	vmax =	0.02 tmax = 713.
direction	upstream	vmin =	-0.01 tmin = 725.

MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT Y - COMPONENT

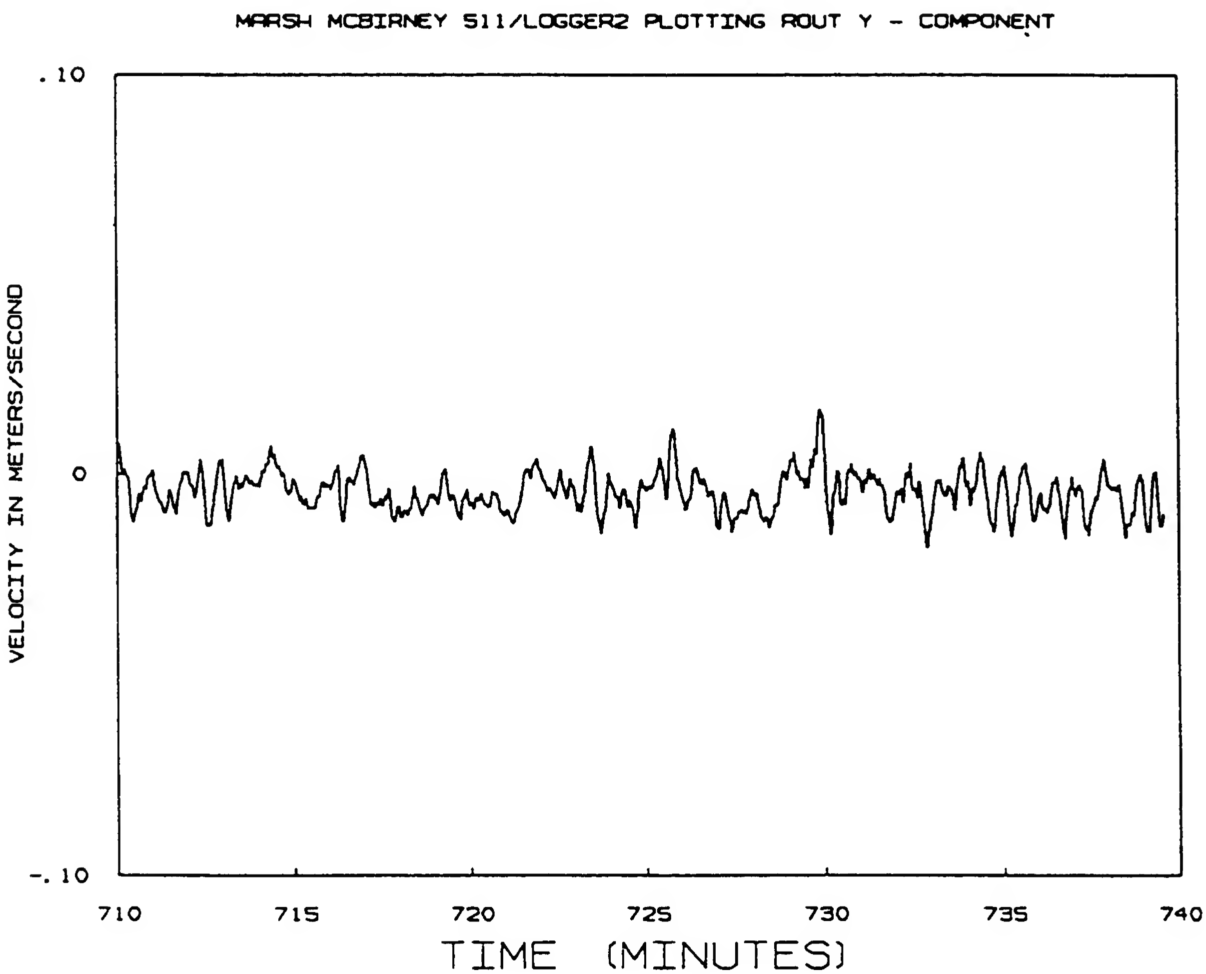


meter number	1131	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.14
speed	5.3 mph	vmax =	0.24 tmax = 728.
direction	upstream	vmin =	0.09 tmin = 717.

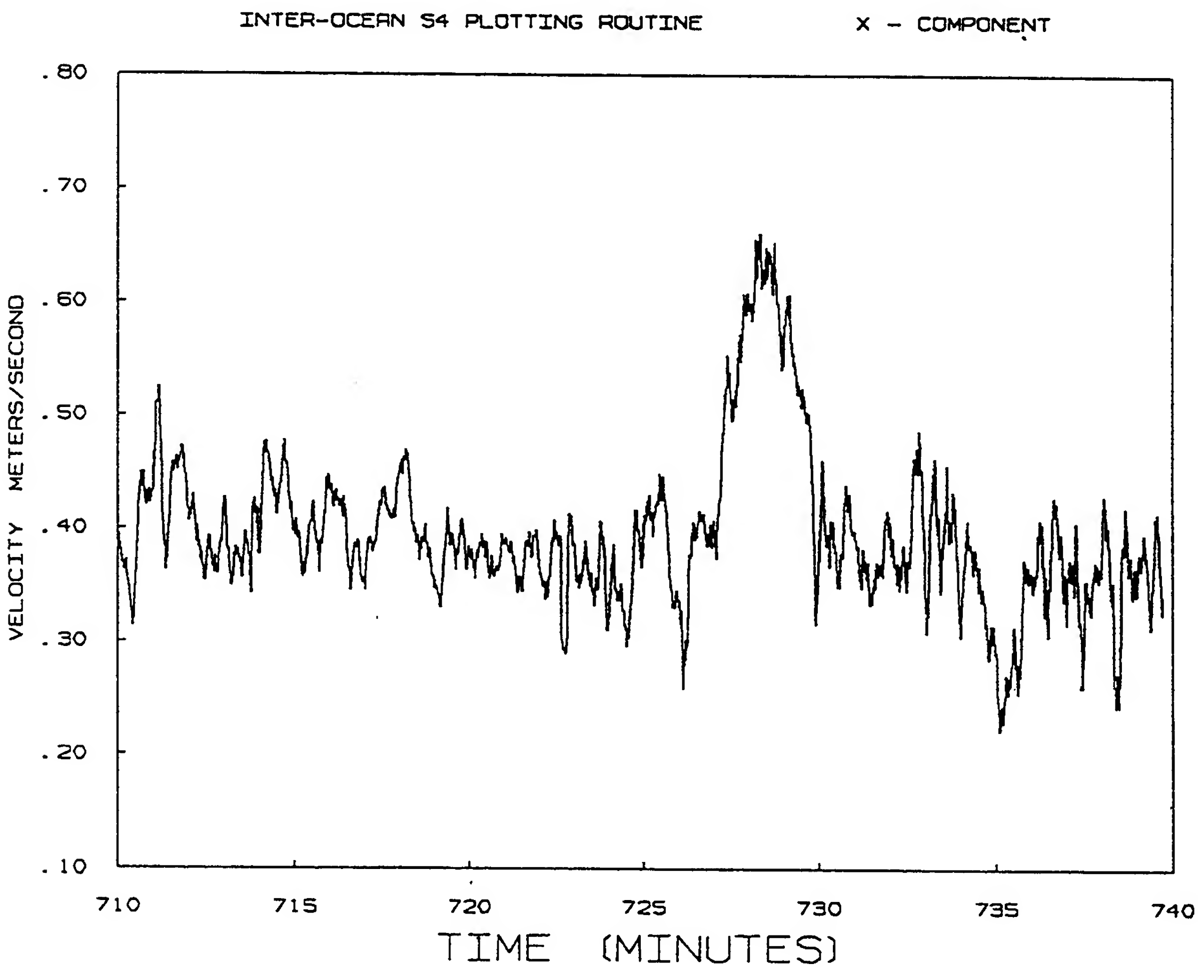
MARSH MCBIRNEY 511/LOGGER2 PLOTTING ROUT X - COMPONENT



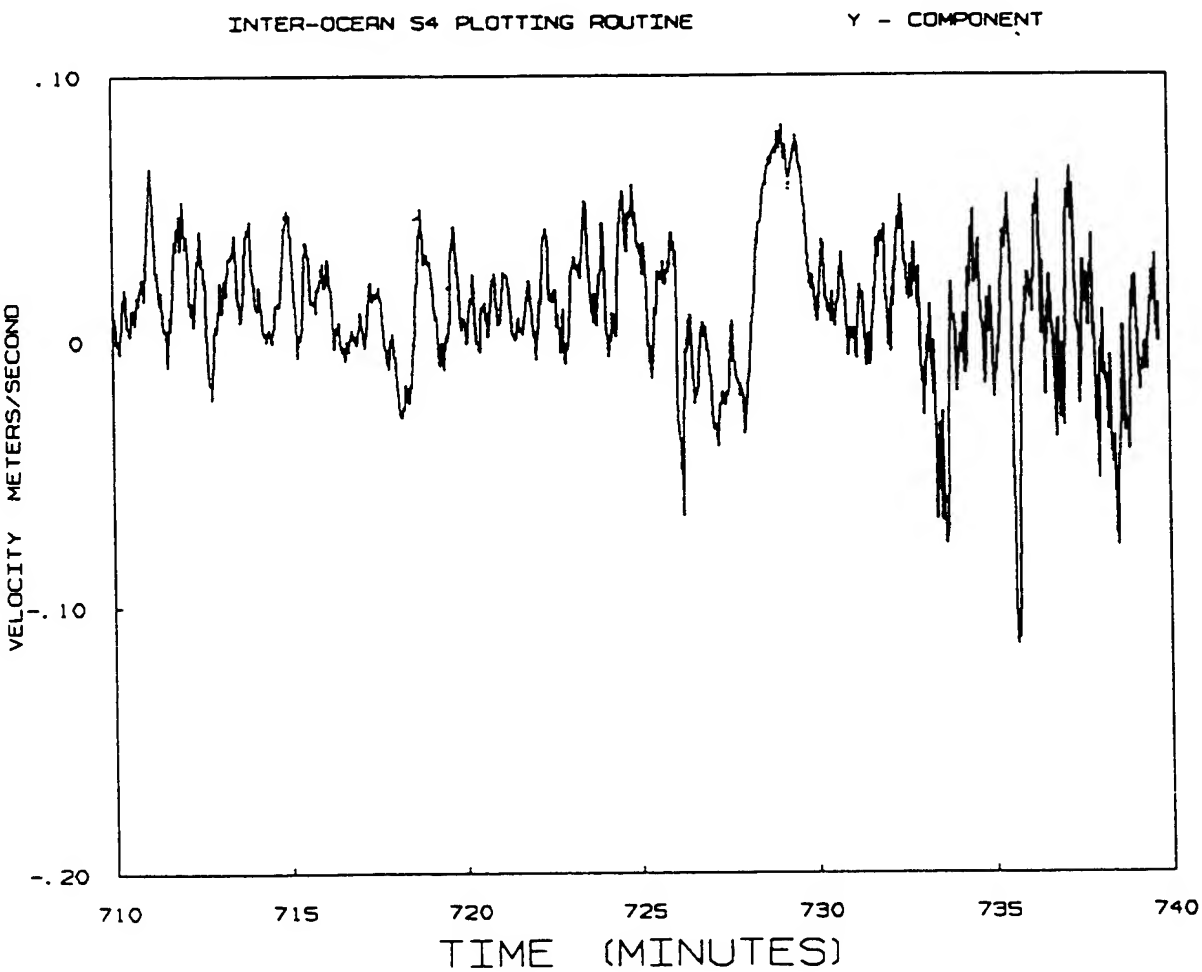
meter number	1131	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	mean =	0.00
speed	5.3 mph	vmax = 0.02	tmax = 730.
direction	upstream	vmin = -0.02	tmin = 733.



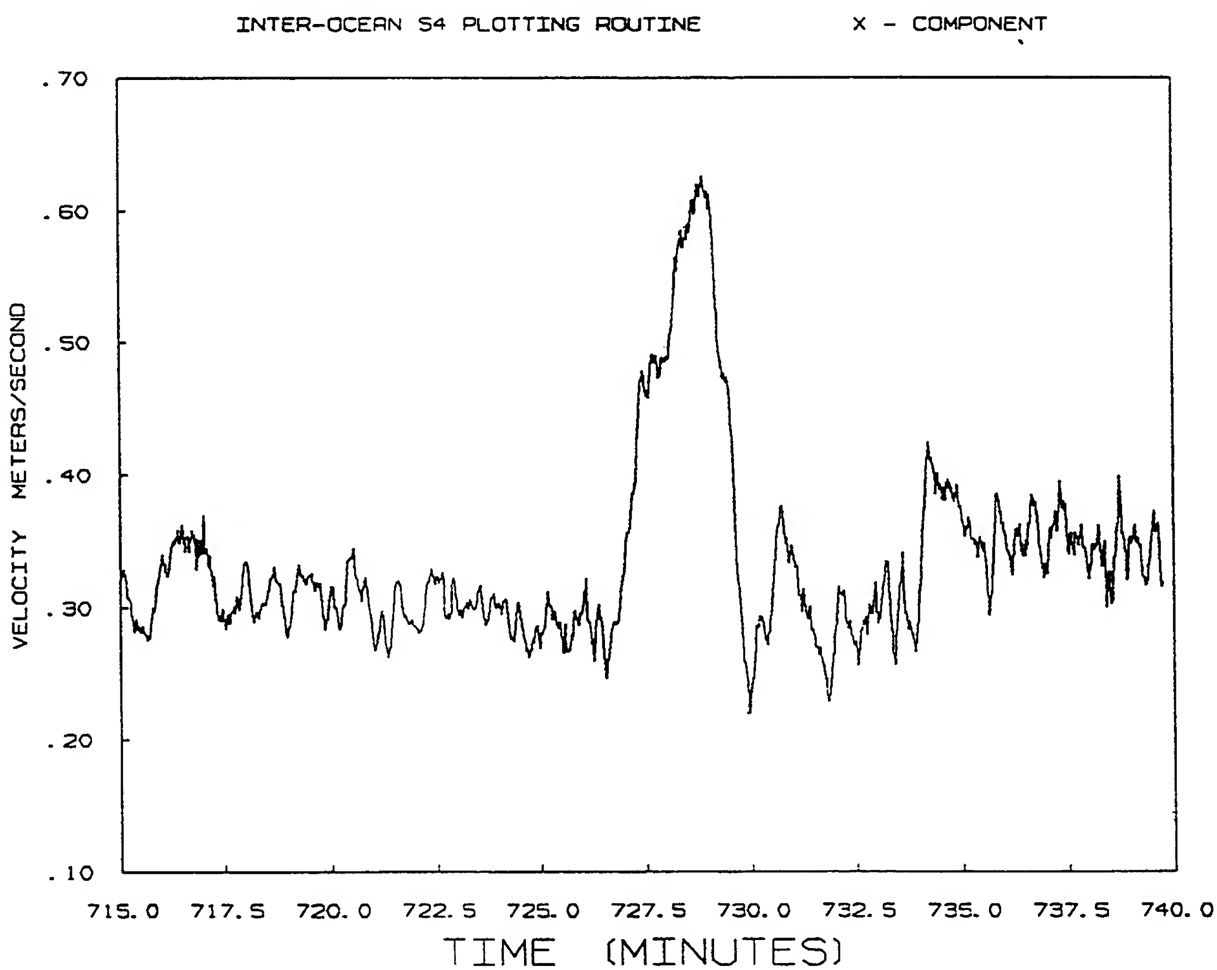
meter number	834	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	MEAN = 0.40	
speed	5.3 mph	VMAX = 0.66	TMAX = 728.
direction	upstream	VMIN = 0.22	TMIN = 735.



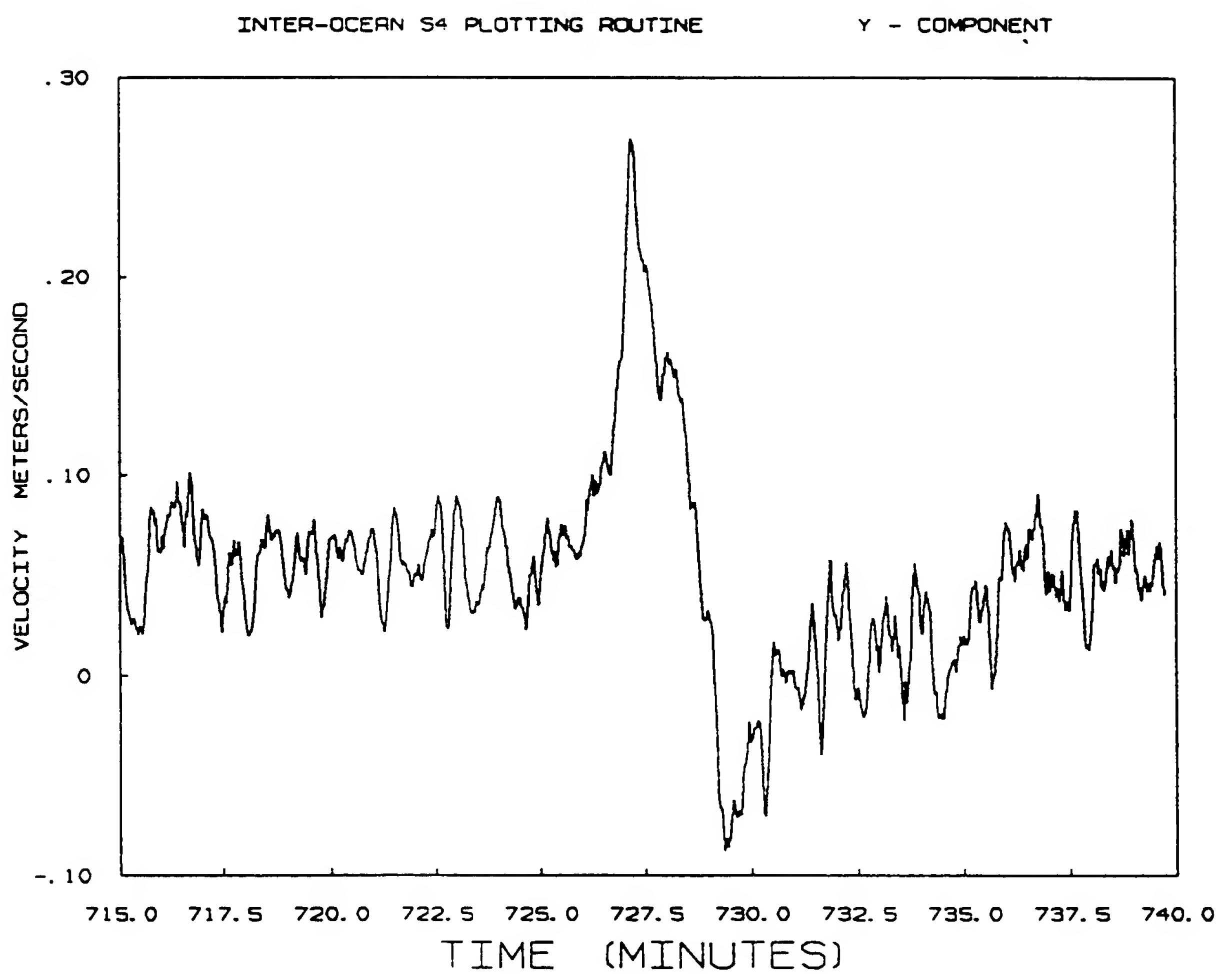
meter number	834	distance	215		
tow name	Jack Bullard	start–time	1150		
configuration	2x1+3x4	end–time	1220		
draft	9.0	MEAN =	0.01		
speed	5.3 mph	VMAX =	0.08	TMAX =	729.
direction	upstream	VMIN =	–0.11	TMIN =	736.



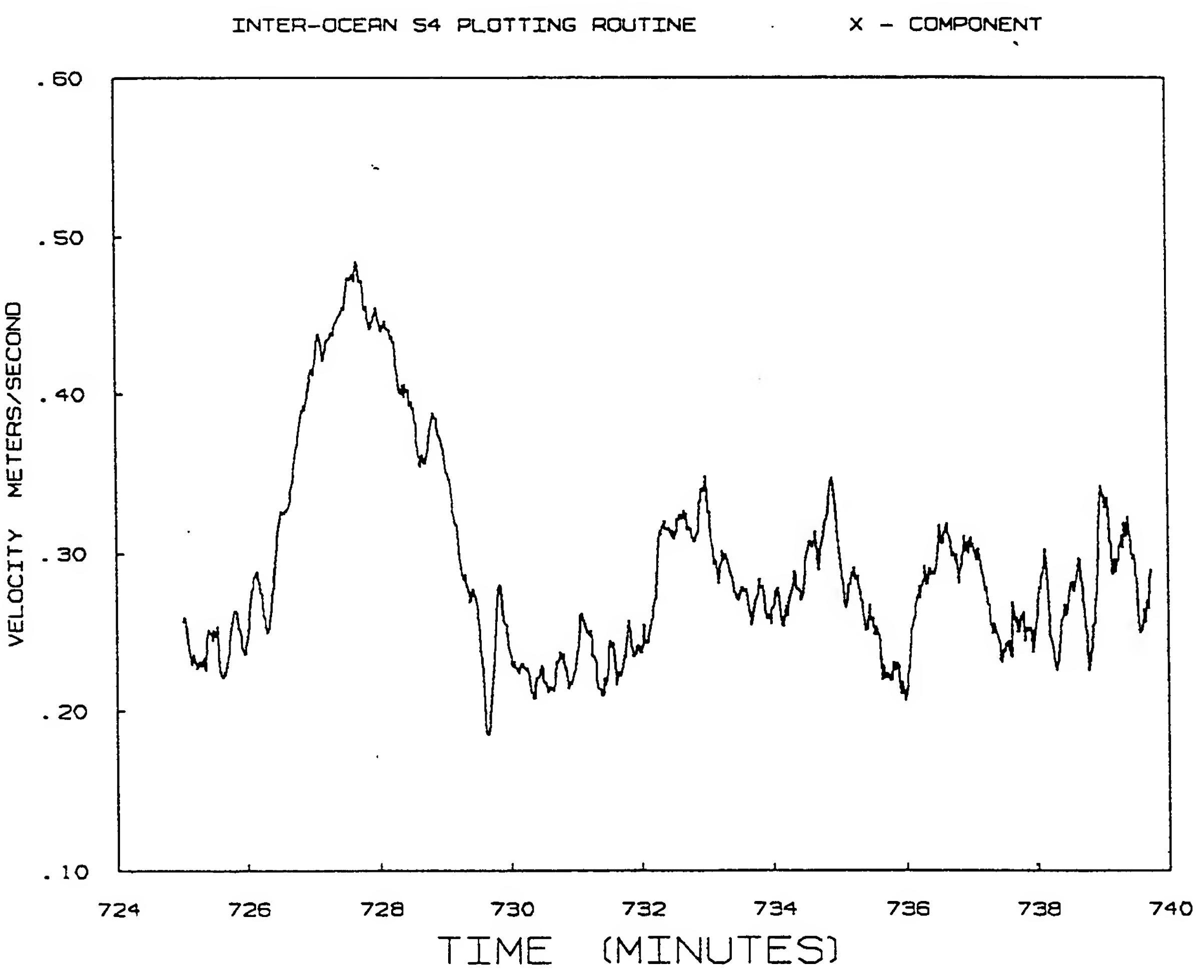
meter number	151	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	MEAN =	0.31
speed	5.3 mph	VMAX = 0.63	TMAX = 729.
direction	upstream	VMIN = 0.22	TMIN = 730.



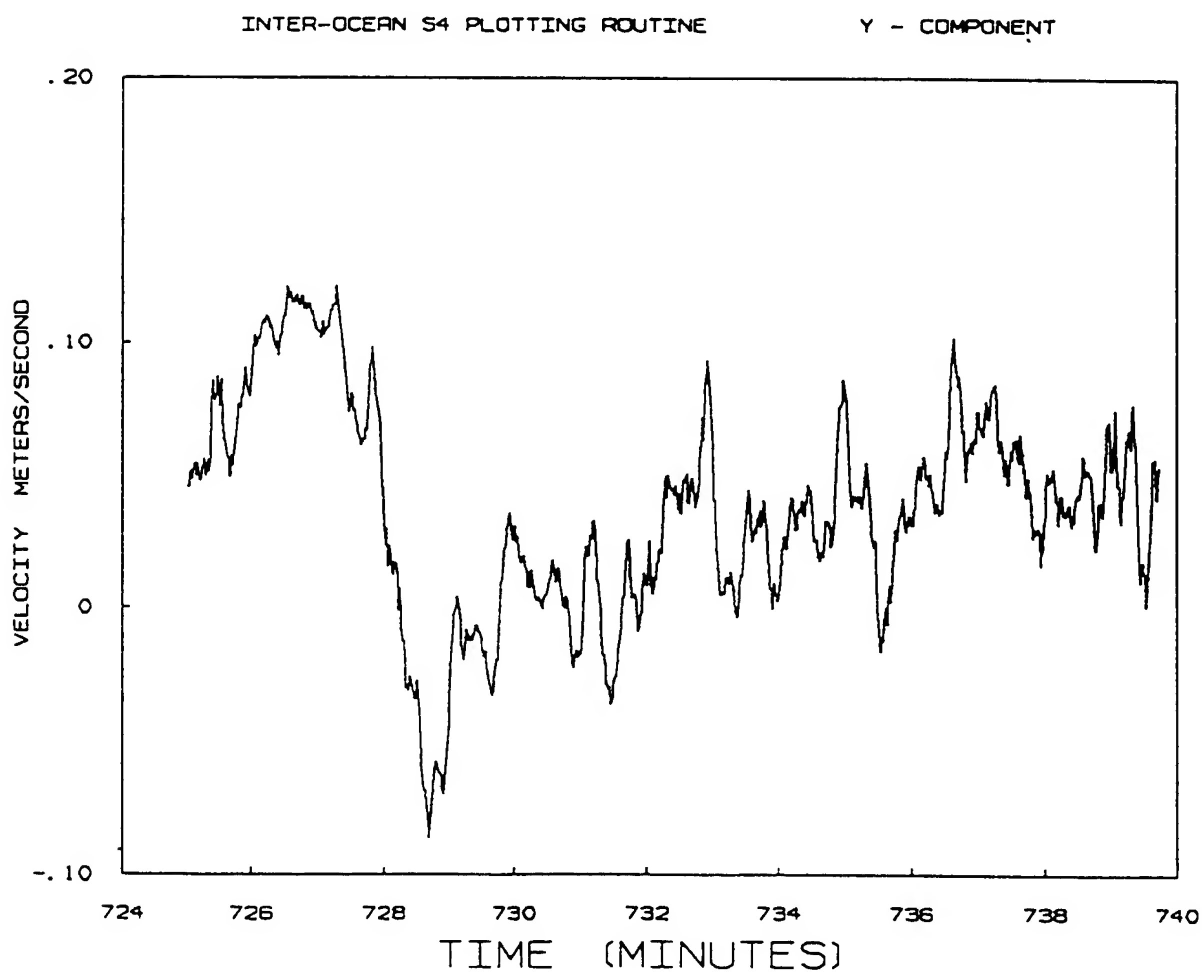
meter number	151	distance	215		
tow name	Jack Bullard	start-time	1150		
configuration	2x1+3x4	end-time	1220		
draft	9.0	MEAN =	0.06		
speed	5.3 mph	VMAX =	0.27	TMAX =	727.
direction	upstream	VMIN =	-0.09	TMIN =	729.



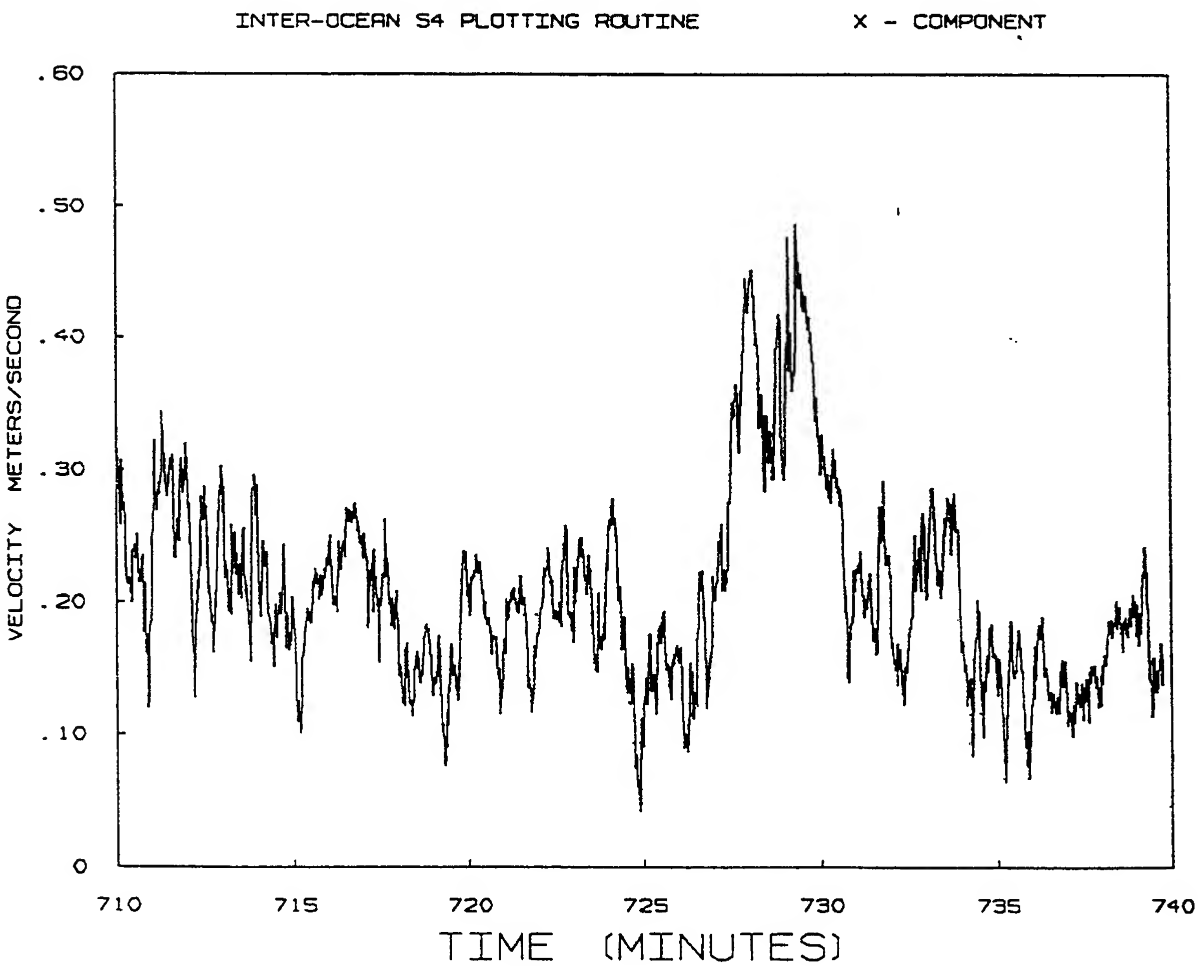
meter number	832	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	MEAN = 0.30	
speed	5.3 mph	VMAX = 0.48	TMAX = 728.
direction	upstream	VMIN = 0.18	TMIN = 730.



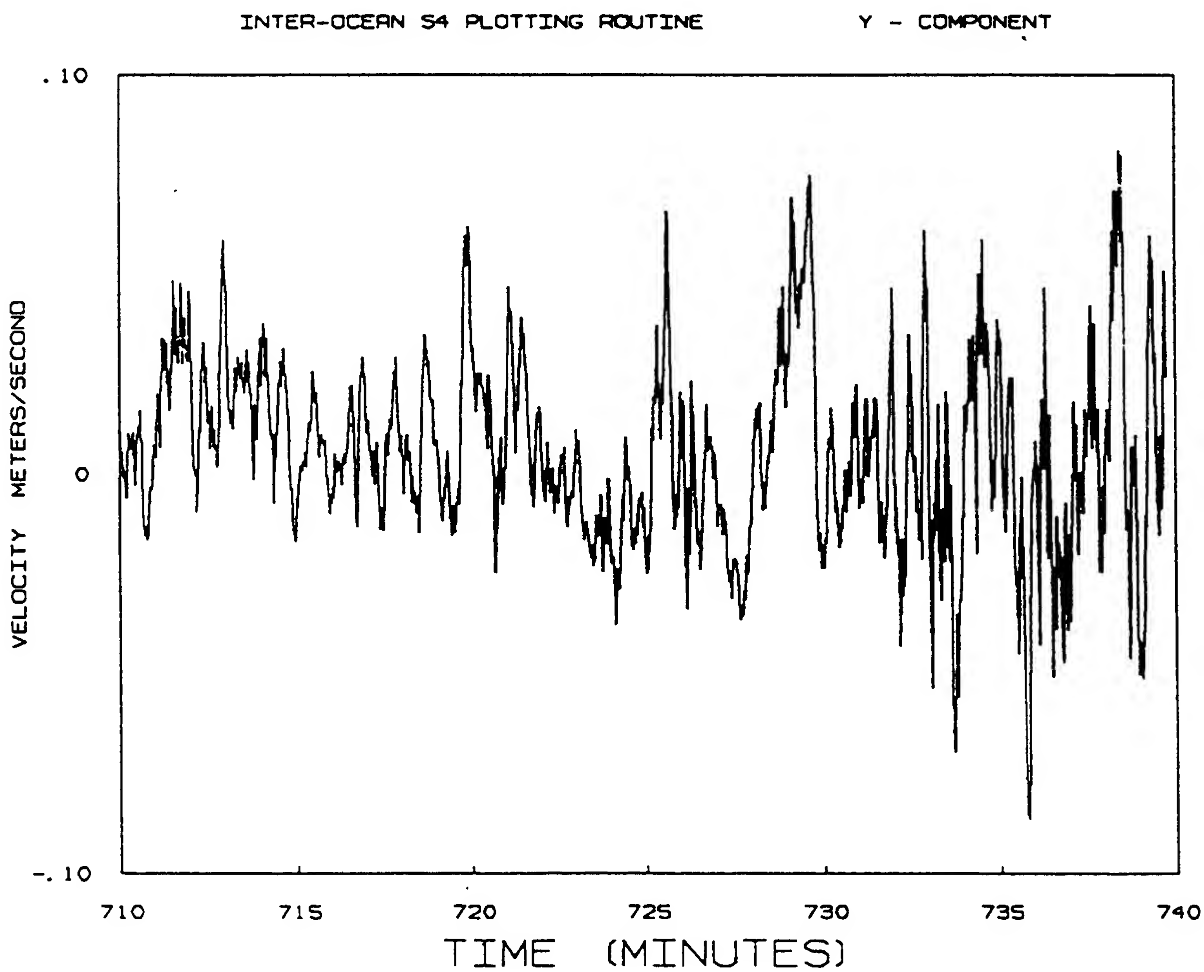
meter number	832	distance	215
tow name	Jack Bullard	start-time	1150
configuration	2x1+3x4	end-time	1220
draft	9.0	MEAN = 0.03	
speed	5.3 mph	VMAX = 0.12	TMAX = 727.
direction	upstream	VMIN = -0.09	TMIN = 729.



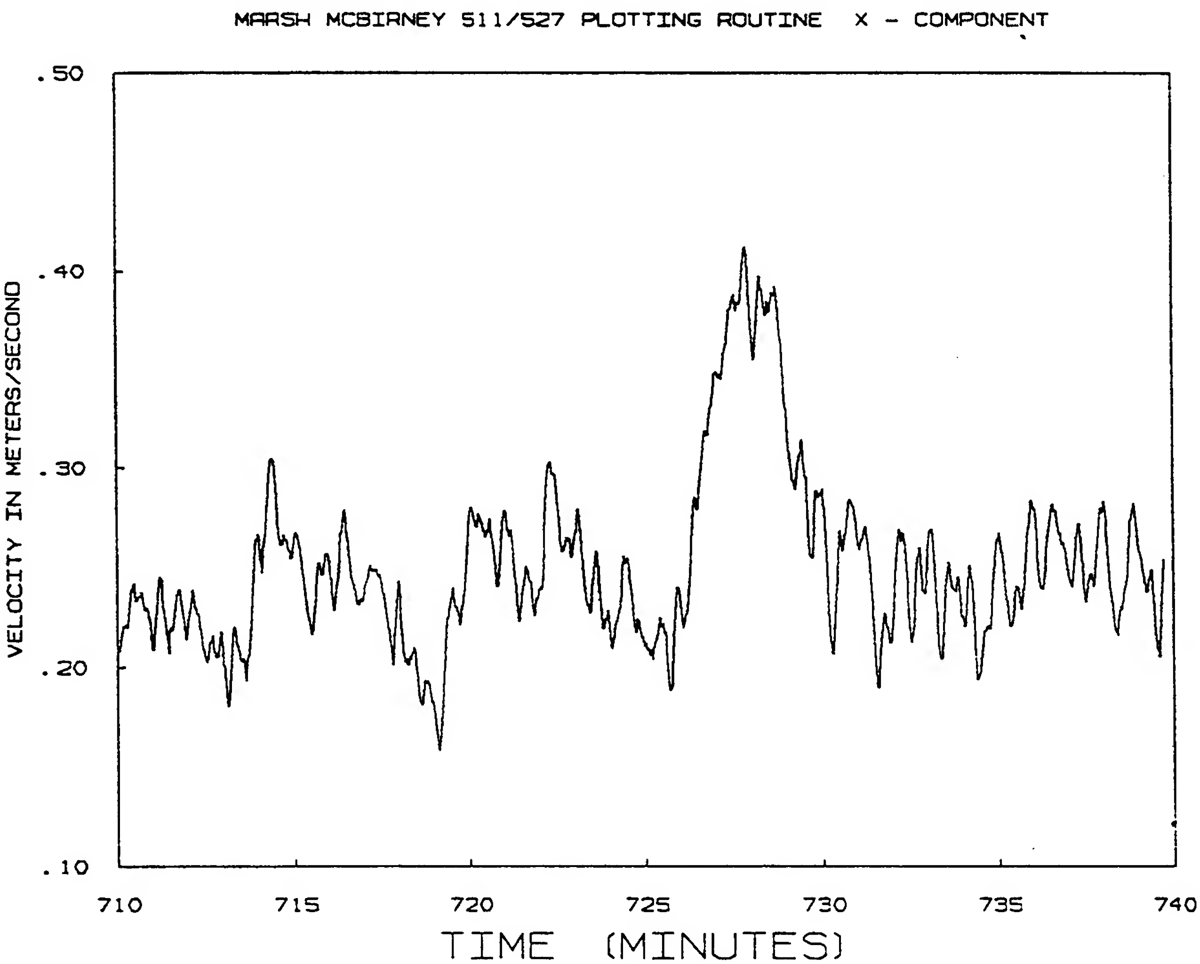
meter number	040	distance	215		
tow name	Jack Bullard	start–time	1150		
configuration	2x1+3x4	end–time	1220		
draft	9.0	MEAN =	0.21		
speed	5.3 mph	VMAX =	0.49	TMAX =	729.
direction	upstream	VMIN =	0.04	TMIN =	725.



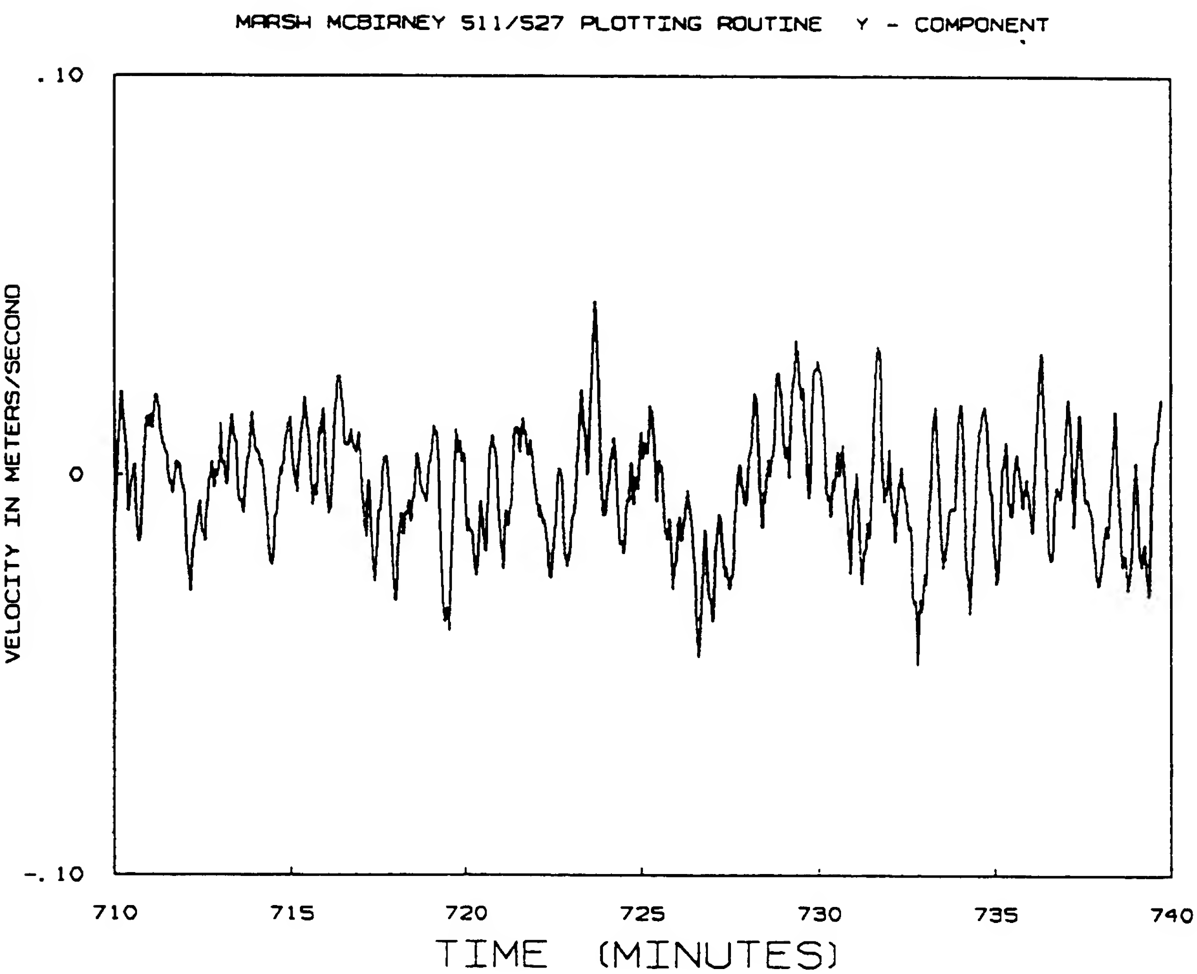
meter number	040	distance	215		
tow name	Jack Bullard	start-time	1150		
configuration	2x1+3x4	end-time	1220		
draft	9.0	MEAN =	0.01		
speed	5.3 mph	VMAX =	0.08	TMAX =	738.
direction	upstream	VMIN =	-0.09	TMIN =	736.



meter number	B-332	start-time	1150
tow name	Jack Bullard	end-time	1220
configuration	2x1+3x4	mean = 0.23	
draft	9.0	vmax = 0.00	tmax = 728.
speed	5.3 mph	vmin = 0.00	tmin = 719.
direction	upstream		
distance	215		

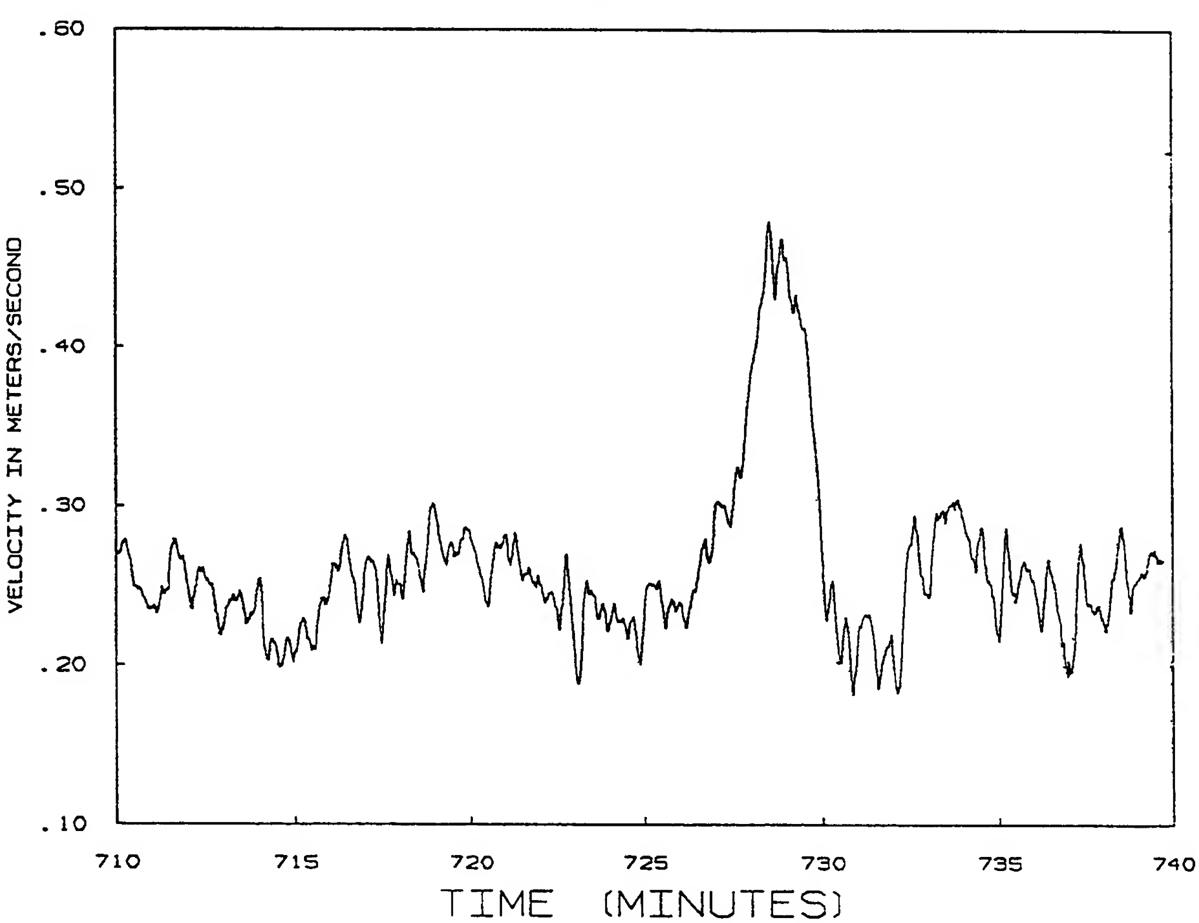


meter number	B-332	start-time	1150
tow name	Jack Bullard	end-time	1220
configuration	2x1+3x4	mean =	0.00
draft	9.0	vmax = 0.00	tmax = 724.
speed	5.3 mph	vmin = 0.00	tmin = 733.
direction	upstream		
distance	215		

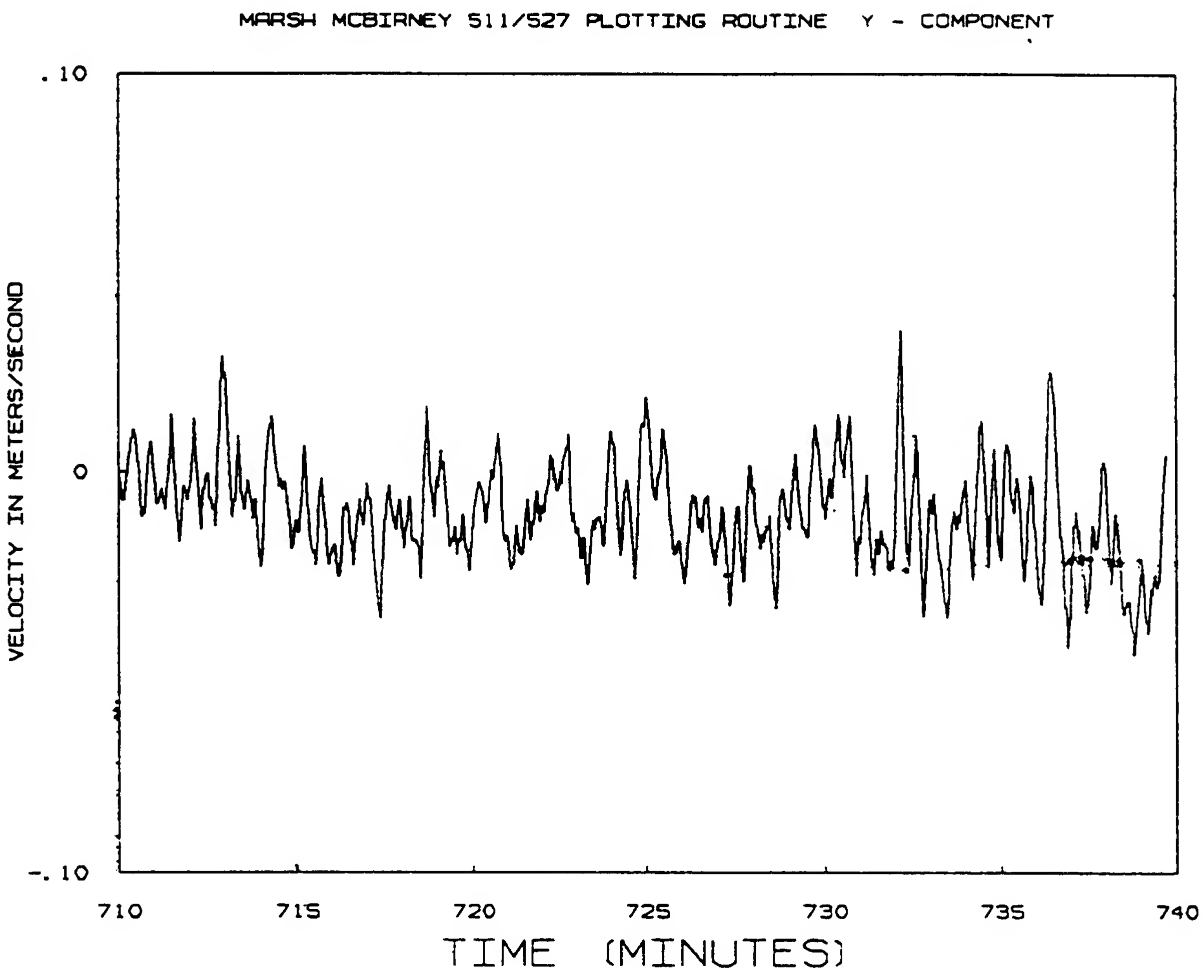


meter number	B-642	start-time	1150
tow name	Jack Bullard	end-time	1220
configuration	2x1+3x4	mean =	0.25
draft	9.0	vmax = 0.00	tmax = 729.
speed	5.3 mph	vmin = 0.00	tmin = 731.
direction	upstream		
distance	215		

MARSH MCBIRNEY 511/527 PLOTTING ROUTINE X - COMPONENT

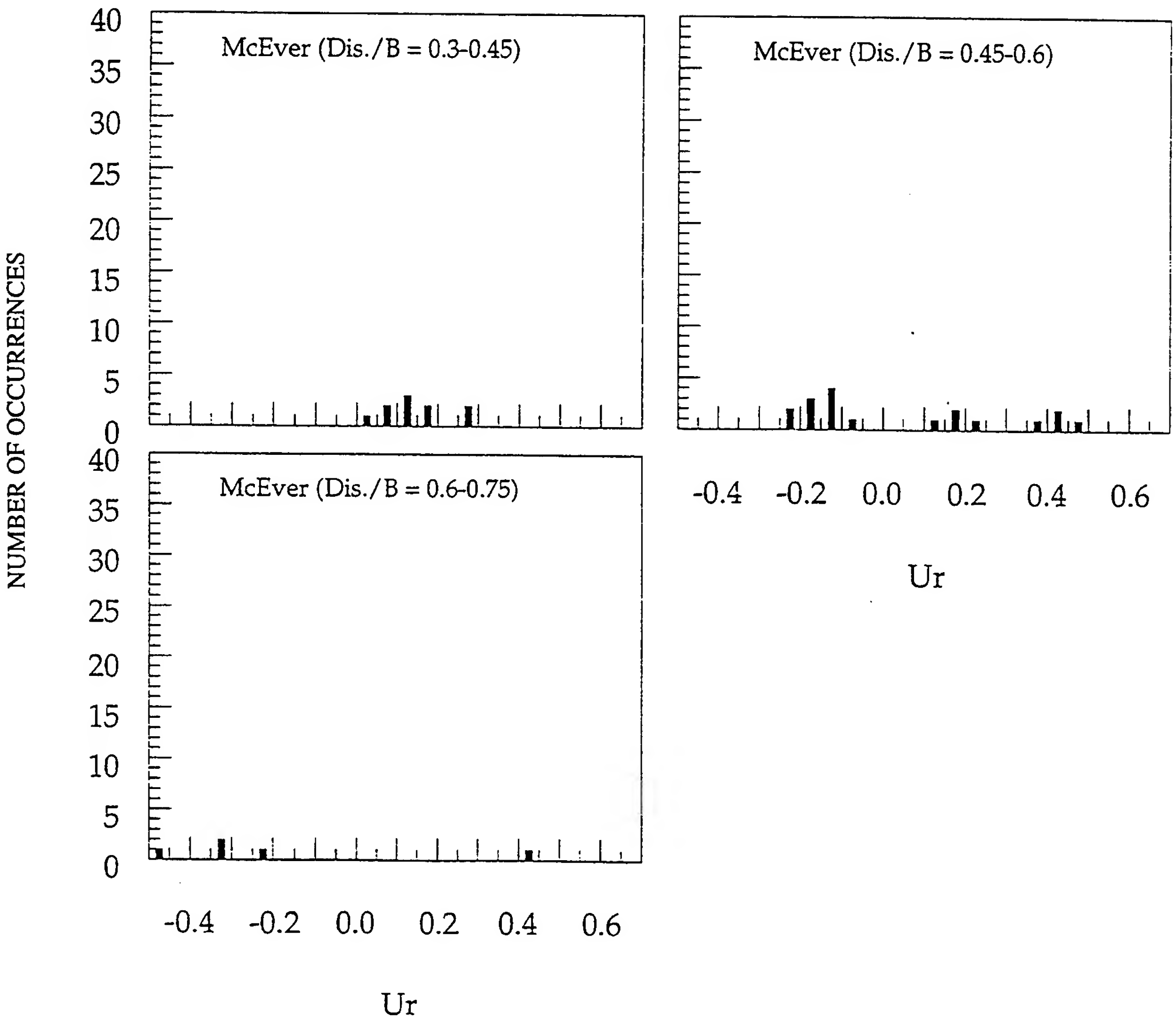


meter number	B-642	start-time	1150
tow name	Jack Bullard	end-time	1220
configuration	2x1+3x4	mean = -0.01	
draft	9.0	vmax = 0.00	tmax = 732.
speed	5.3 mph	vmin = 0.00	tmin = 739.
direction	upstream		
distance	215		



APPENDIX XXI.

HISTOGRAMS OF MAXIMUM RETURN VELOCITY WITHIN VARIOUS ZONES FOR ALL STUDY SITES



XXI-1. Histograms of $U_{r(max)}$ within various zones, McEver's Island ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)

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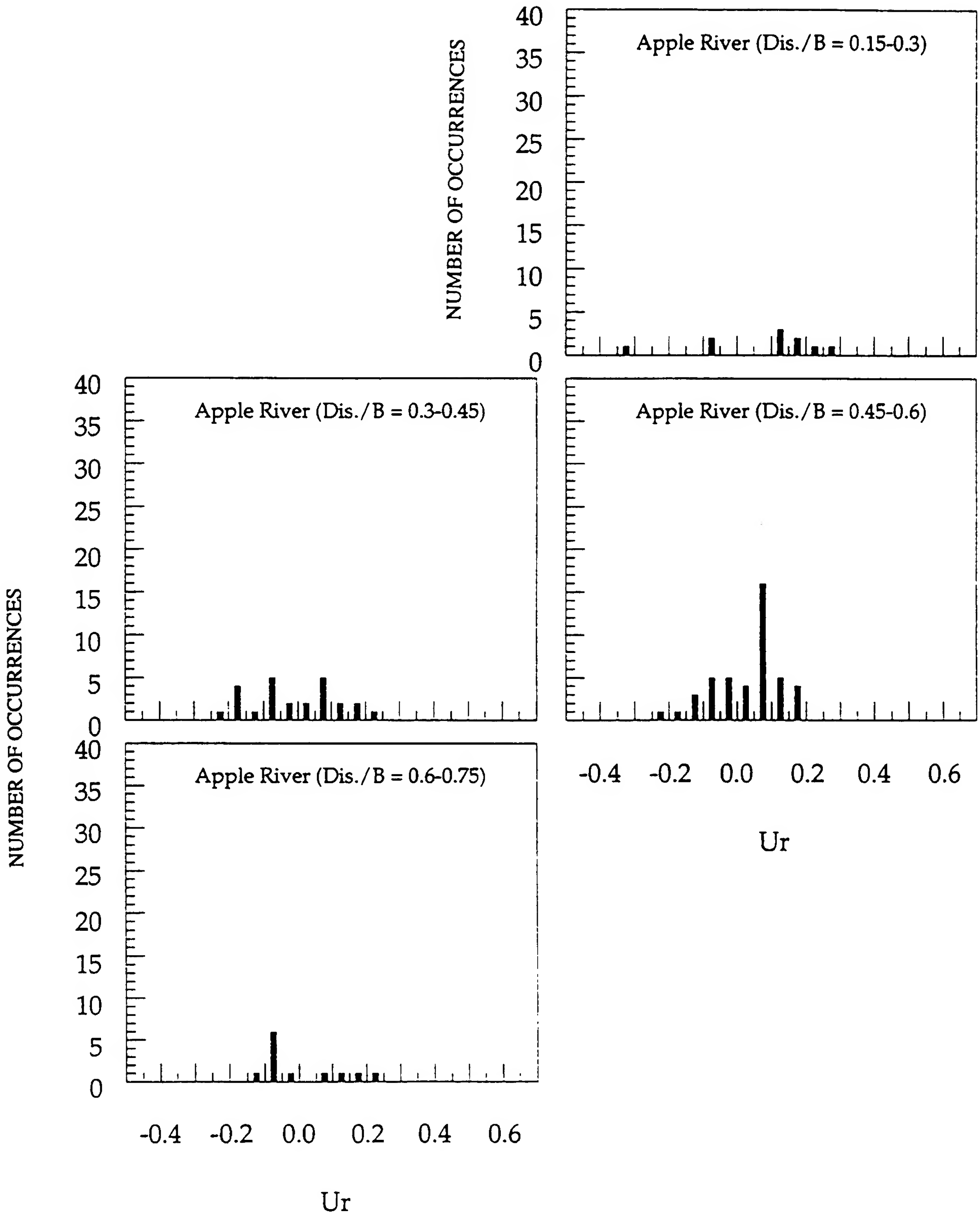
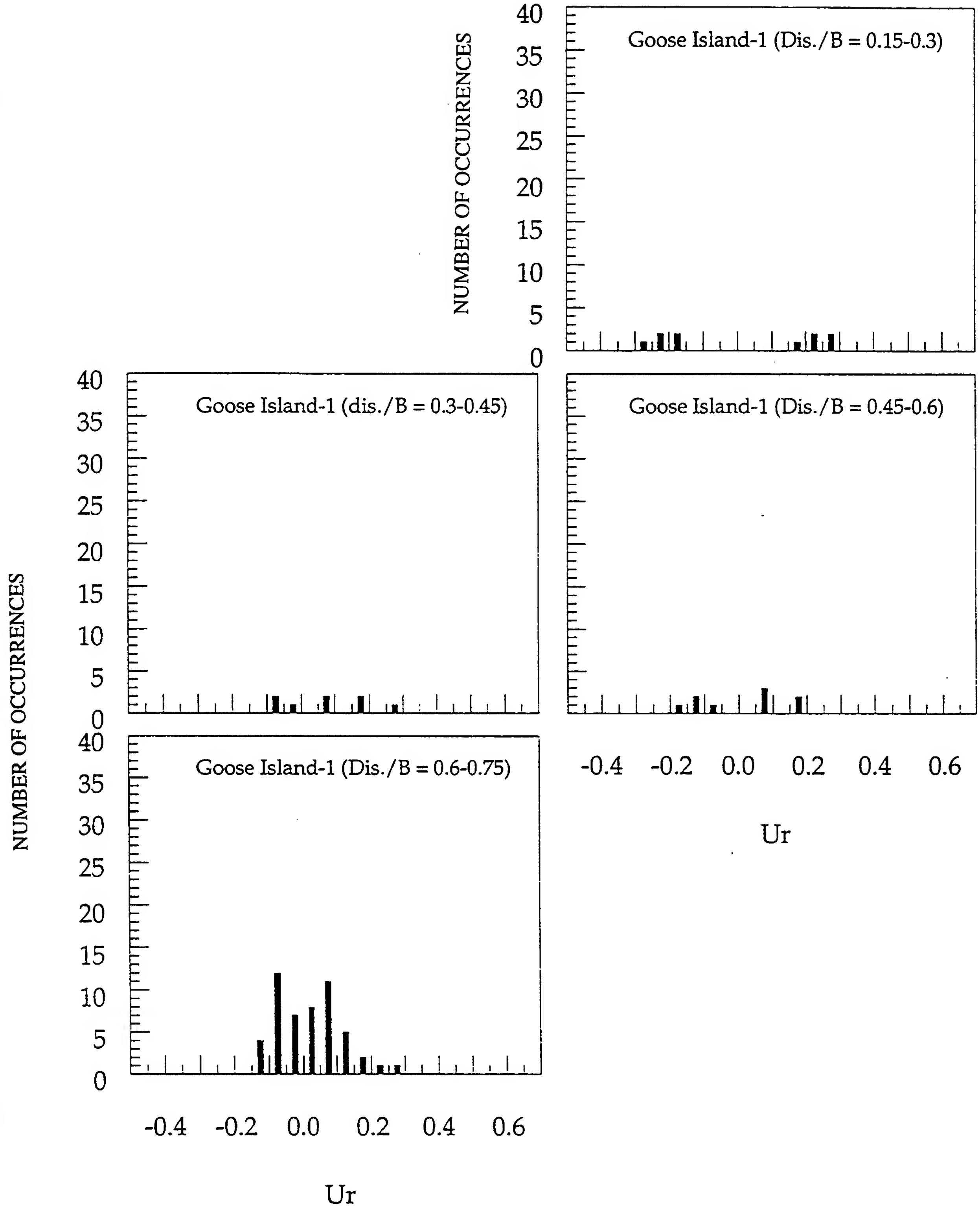
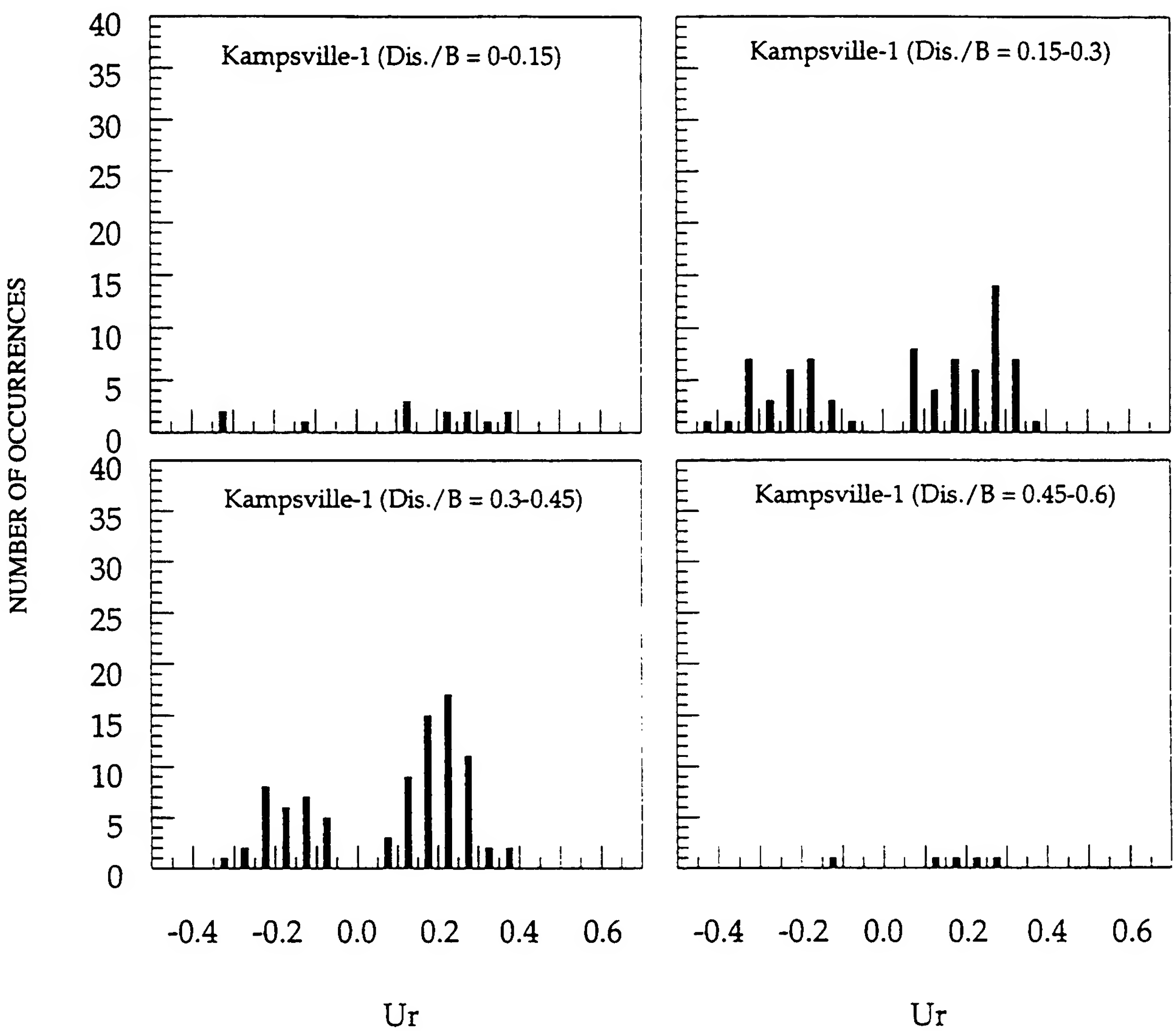


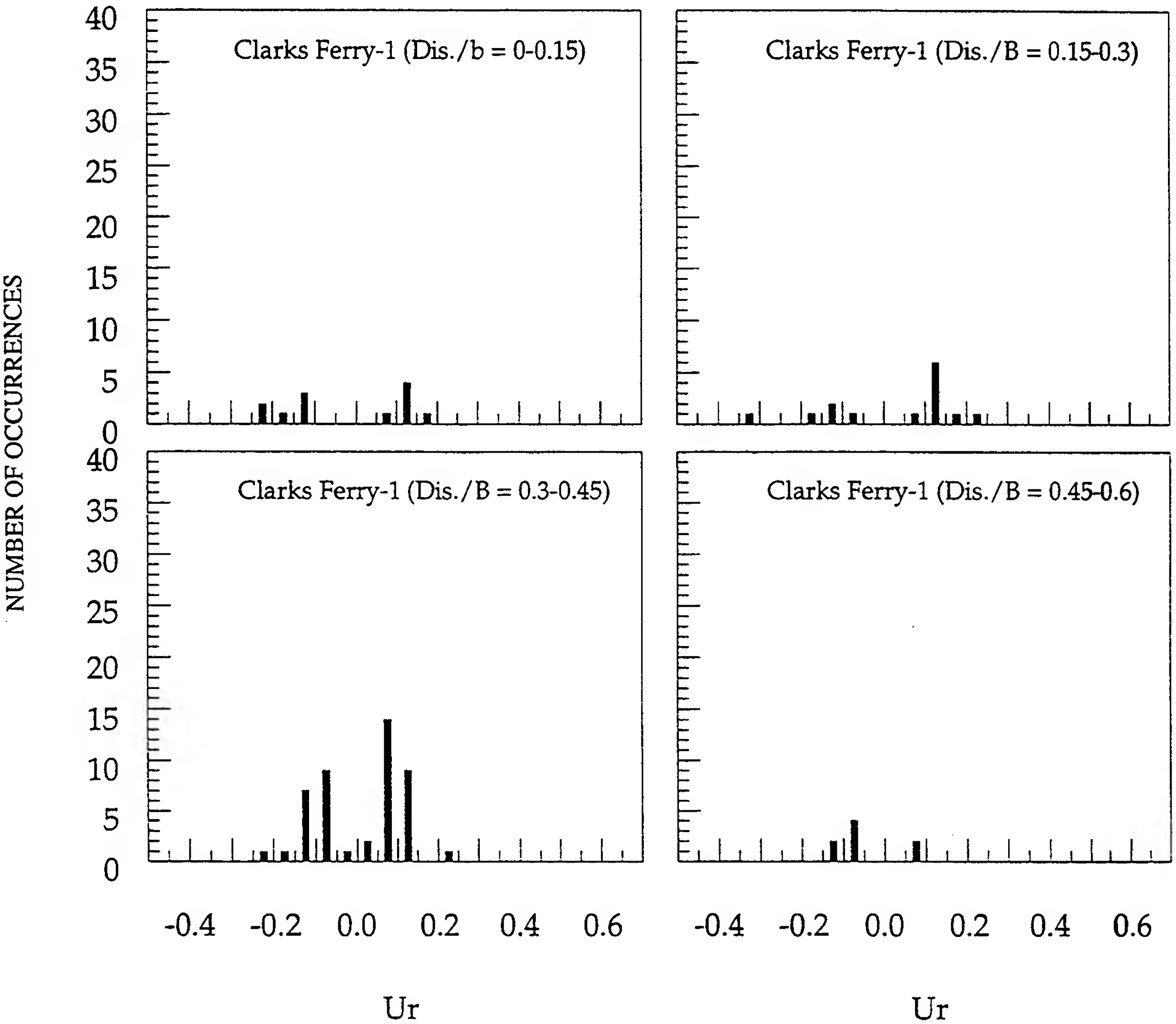
XXI-2. Histograms of $U_{r(max)}$ within various zones, Apple River Island
($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



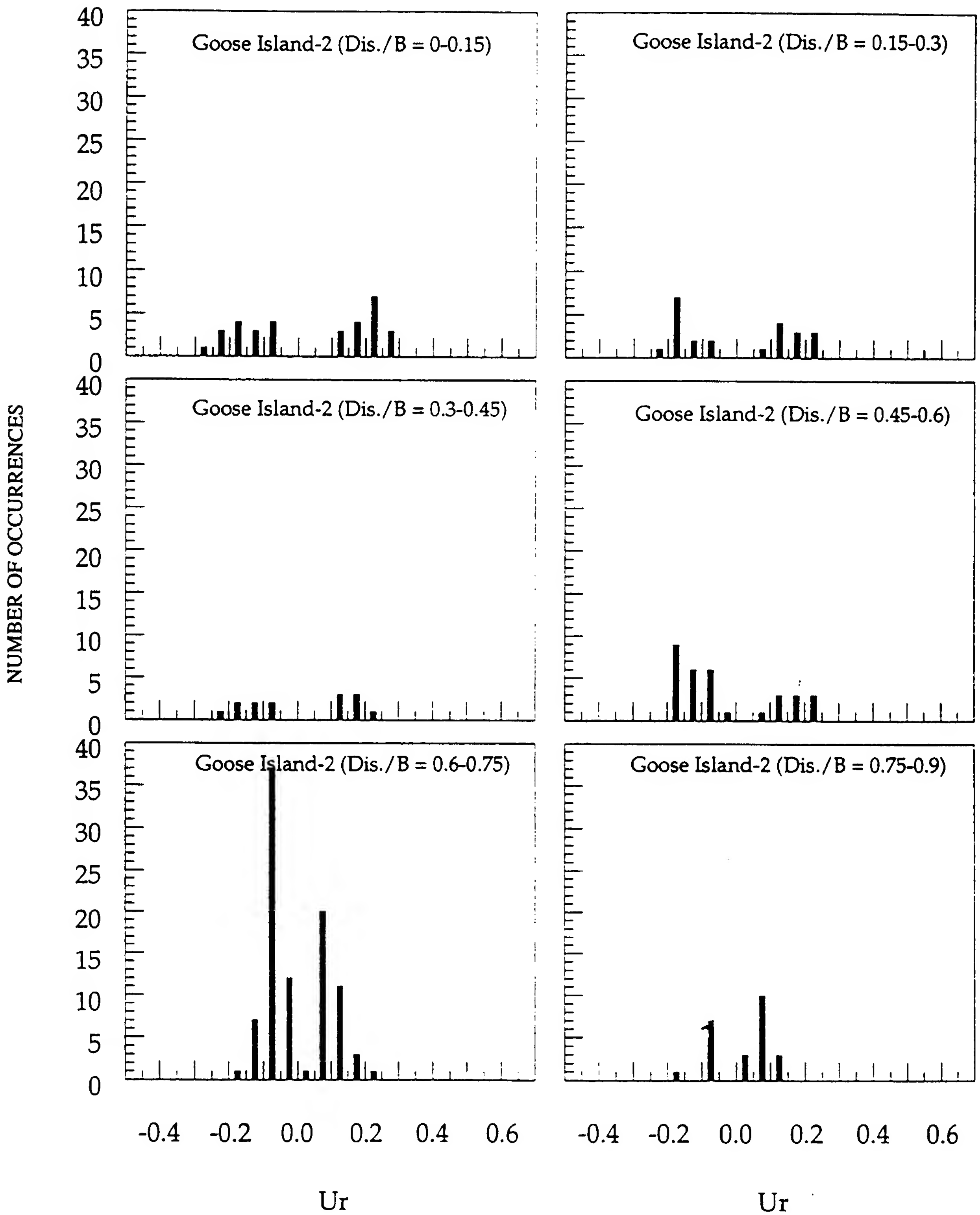
XXI-3. Histograms of $U_{r(max)}$ within various zones, Goose Island, trip 1 ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



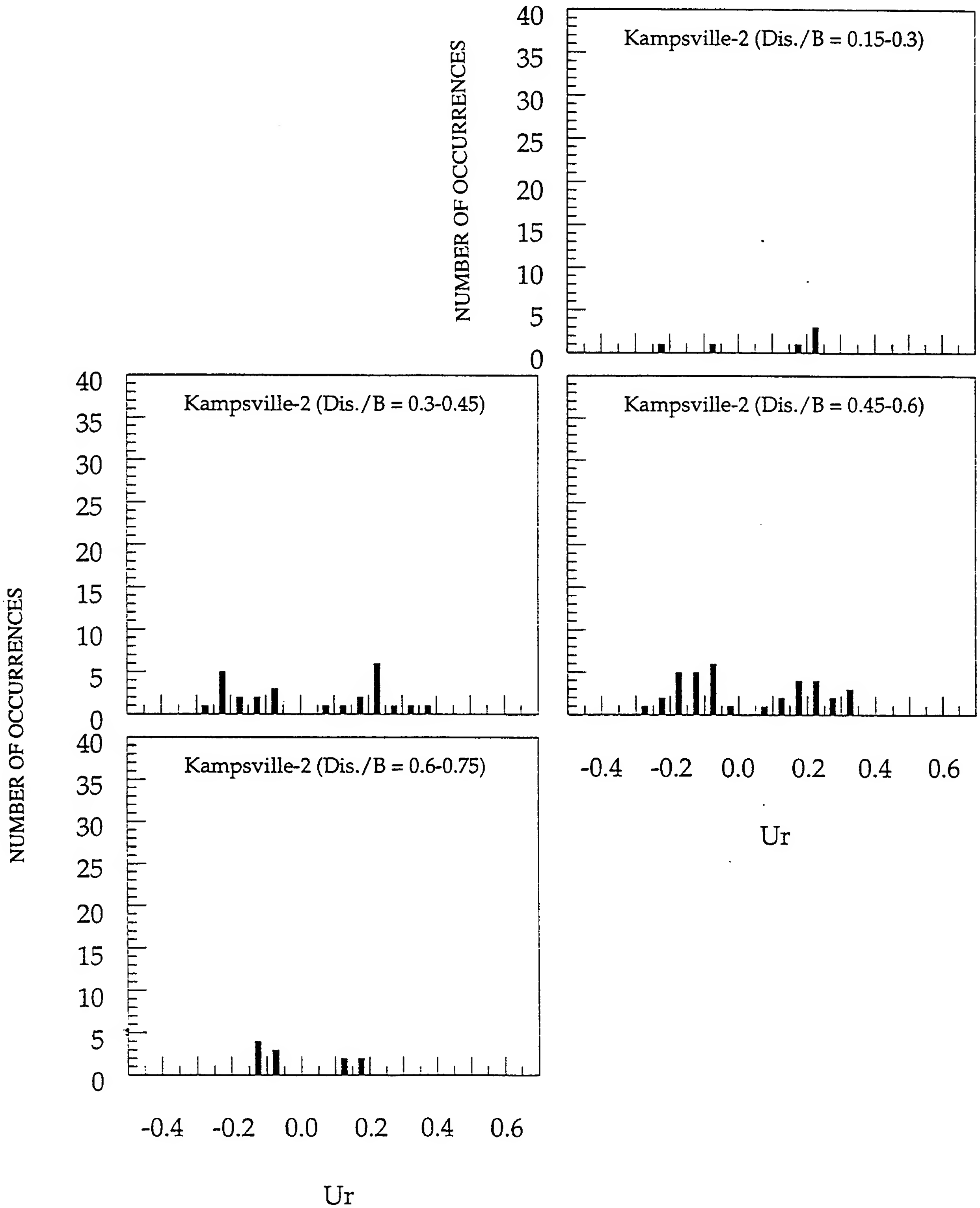
XXI-4. Histograms of $U_{r(max)}$ within various zones, Kampsville, trip 1 ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



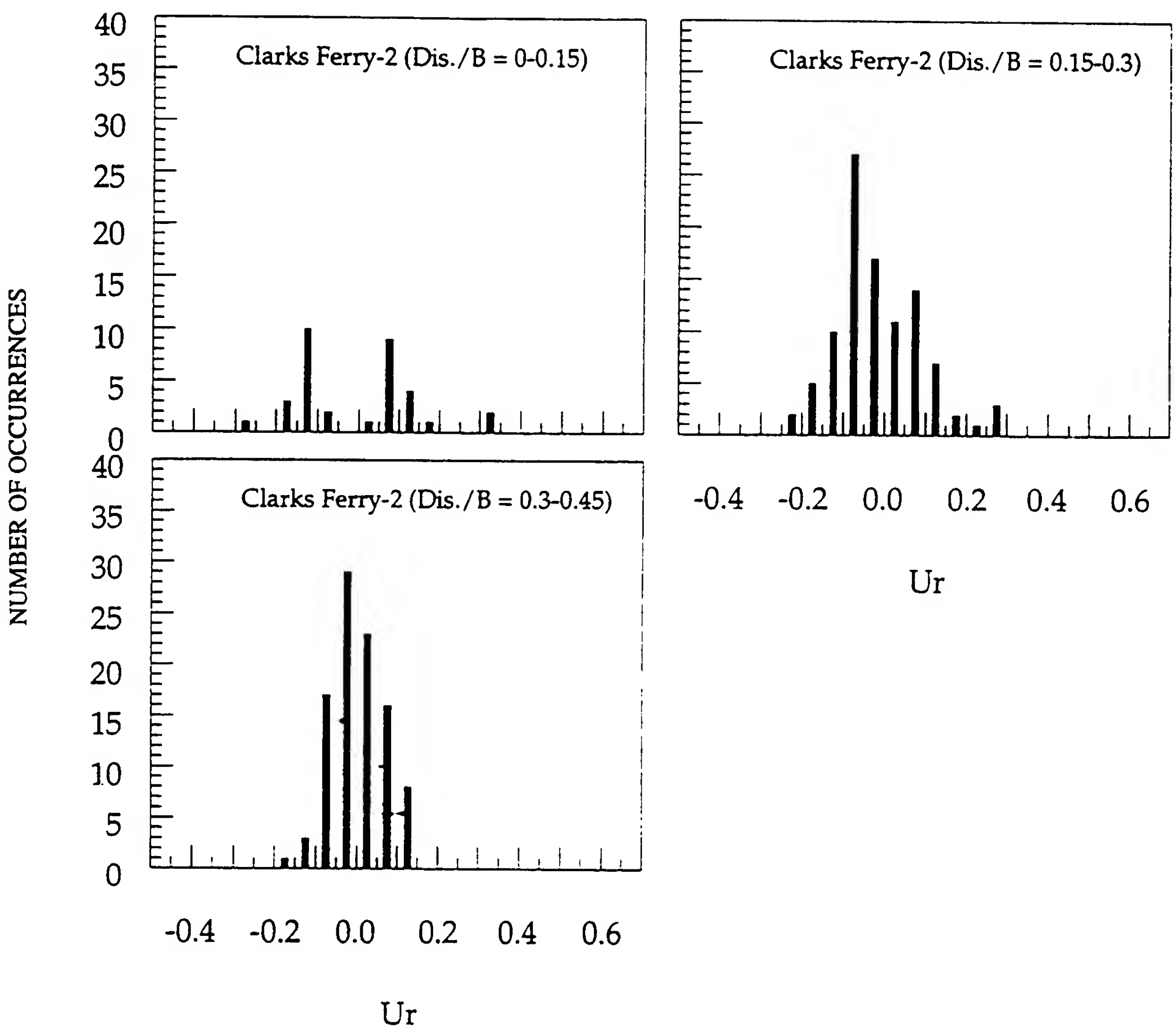
XXI-5. Histograms of $U_{r(max)}$ within various zones, Clarks Ferry, trip 1 ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



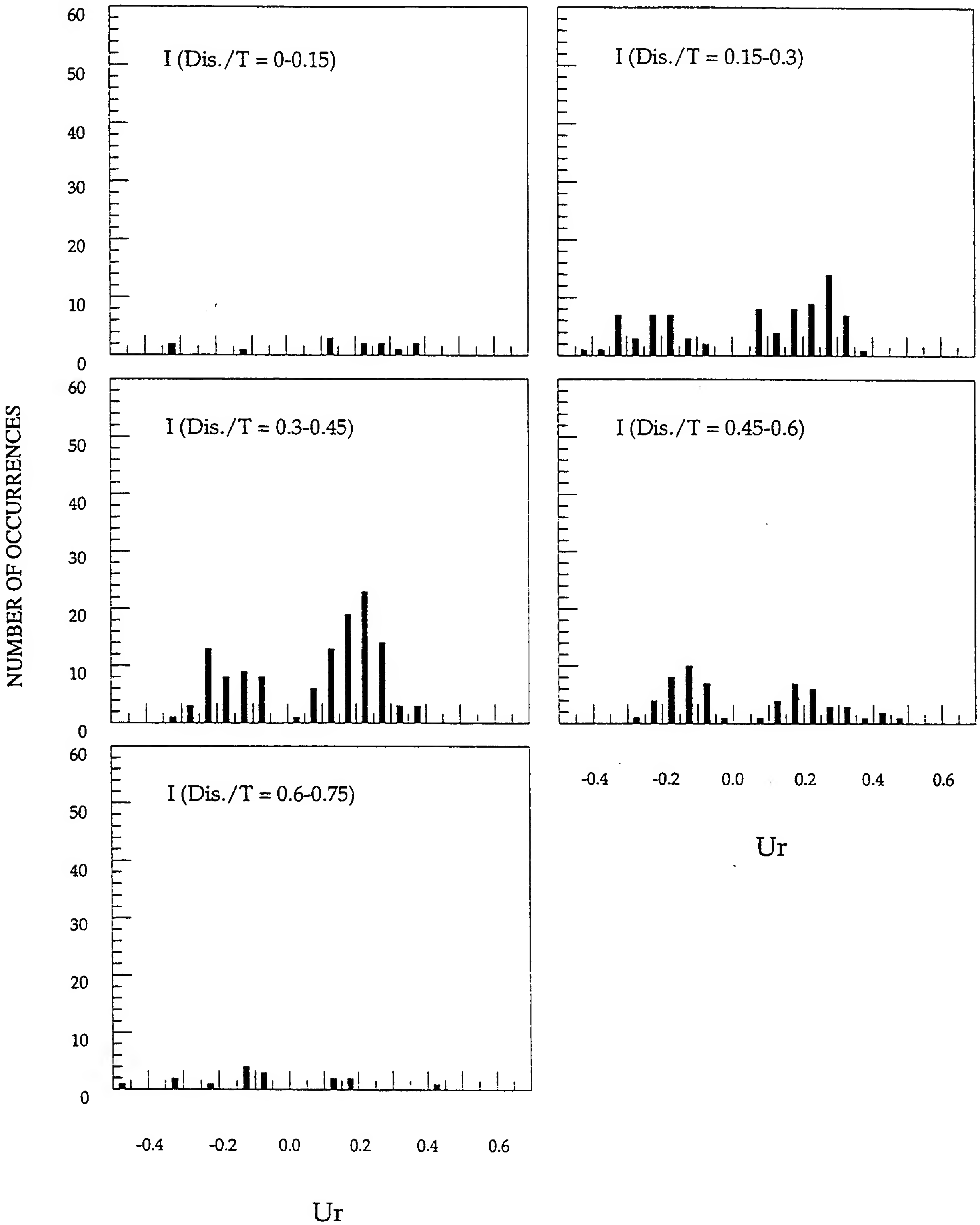
XXI-6. Histograms of $U_{r(max)}$ within various zones, Goose Island, trip 2 ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



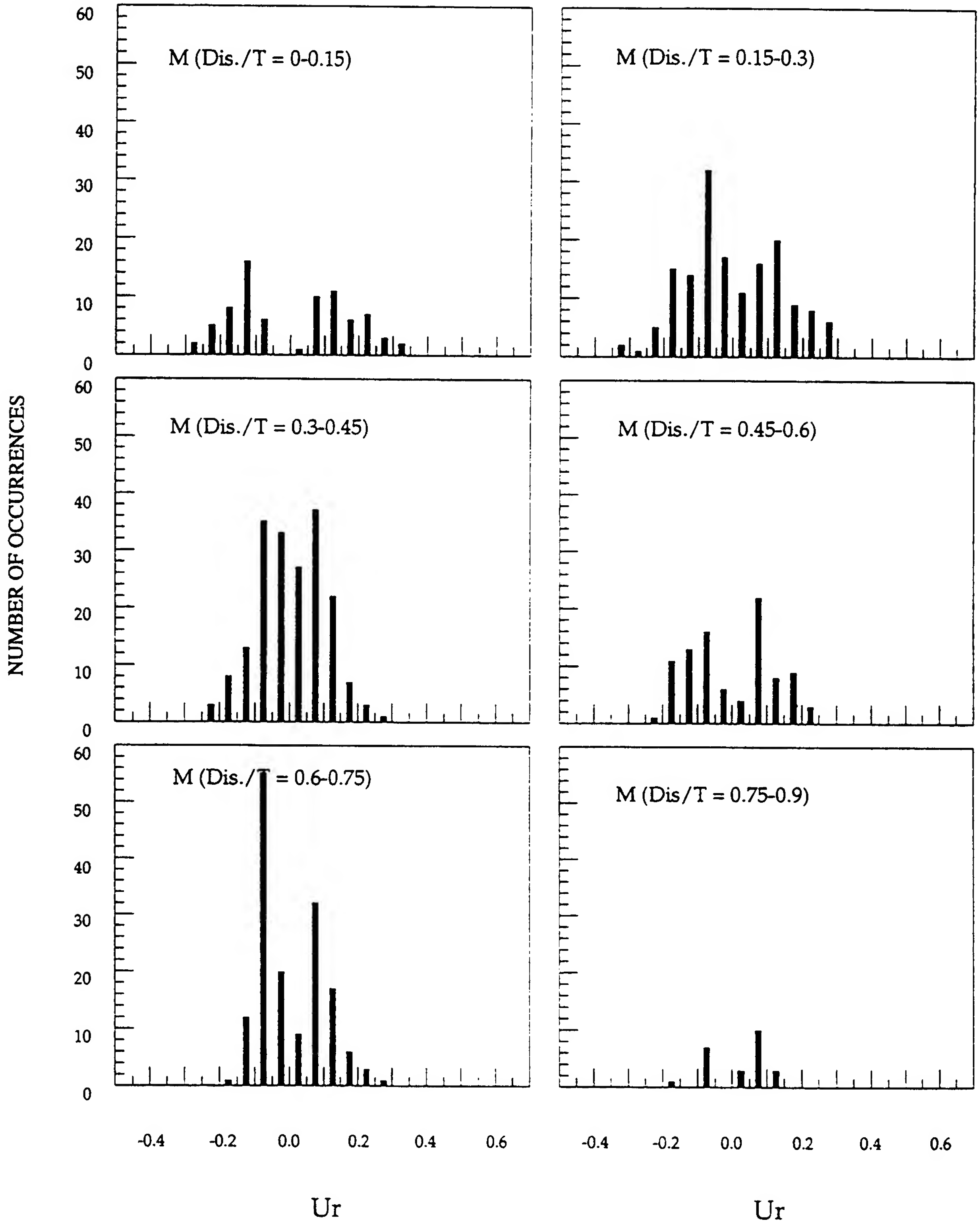
XXI-7. Histograms of $U_{r(max)}$ within various zones, Kampsville, trip 2 ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



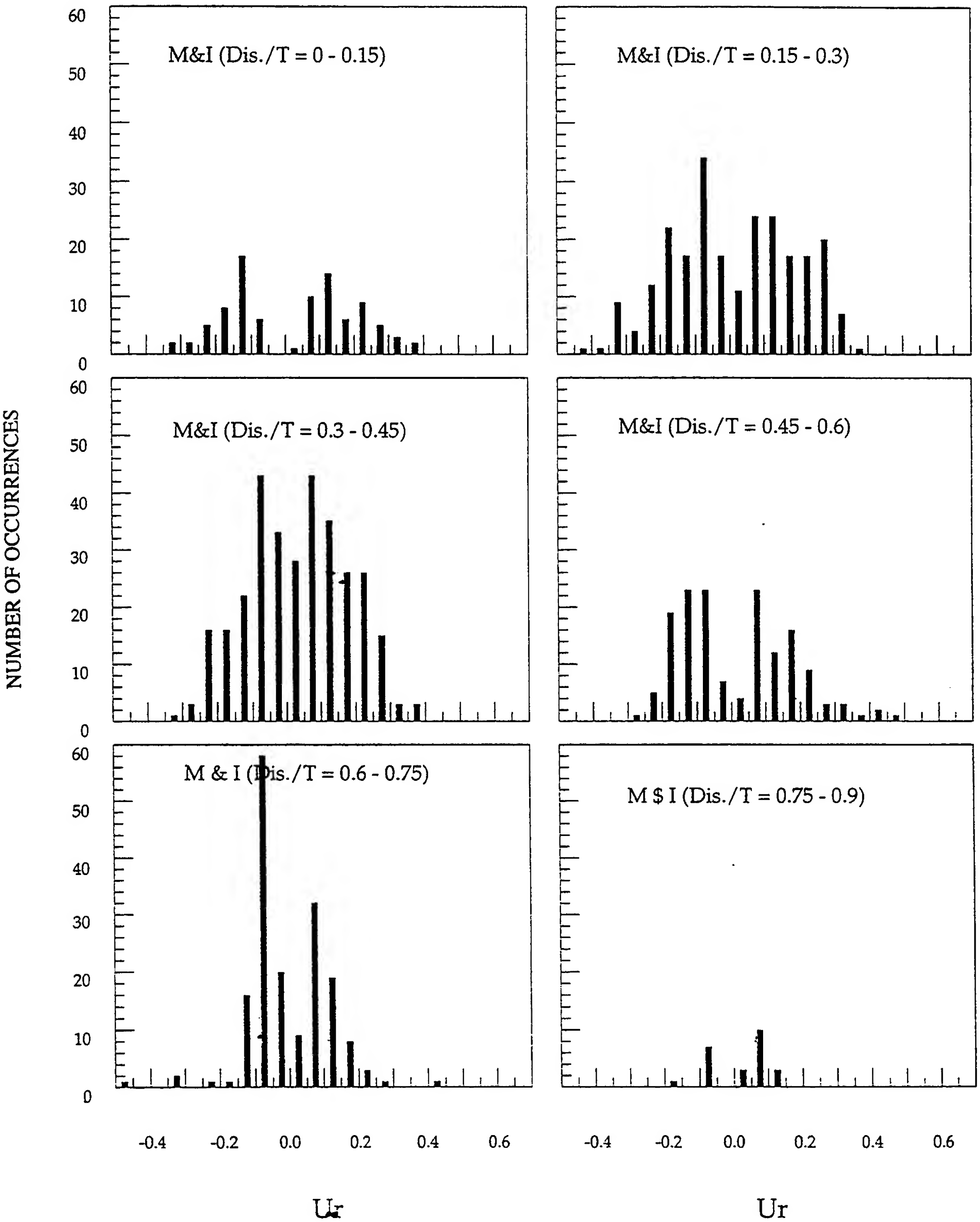
XXI-8. Histograms of $U_{r(max)}$ within various zones, Clarks Ferry, trip 2 (Ur_{max} carries signs to indicate an upstream- or downstream-bound barge effect)



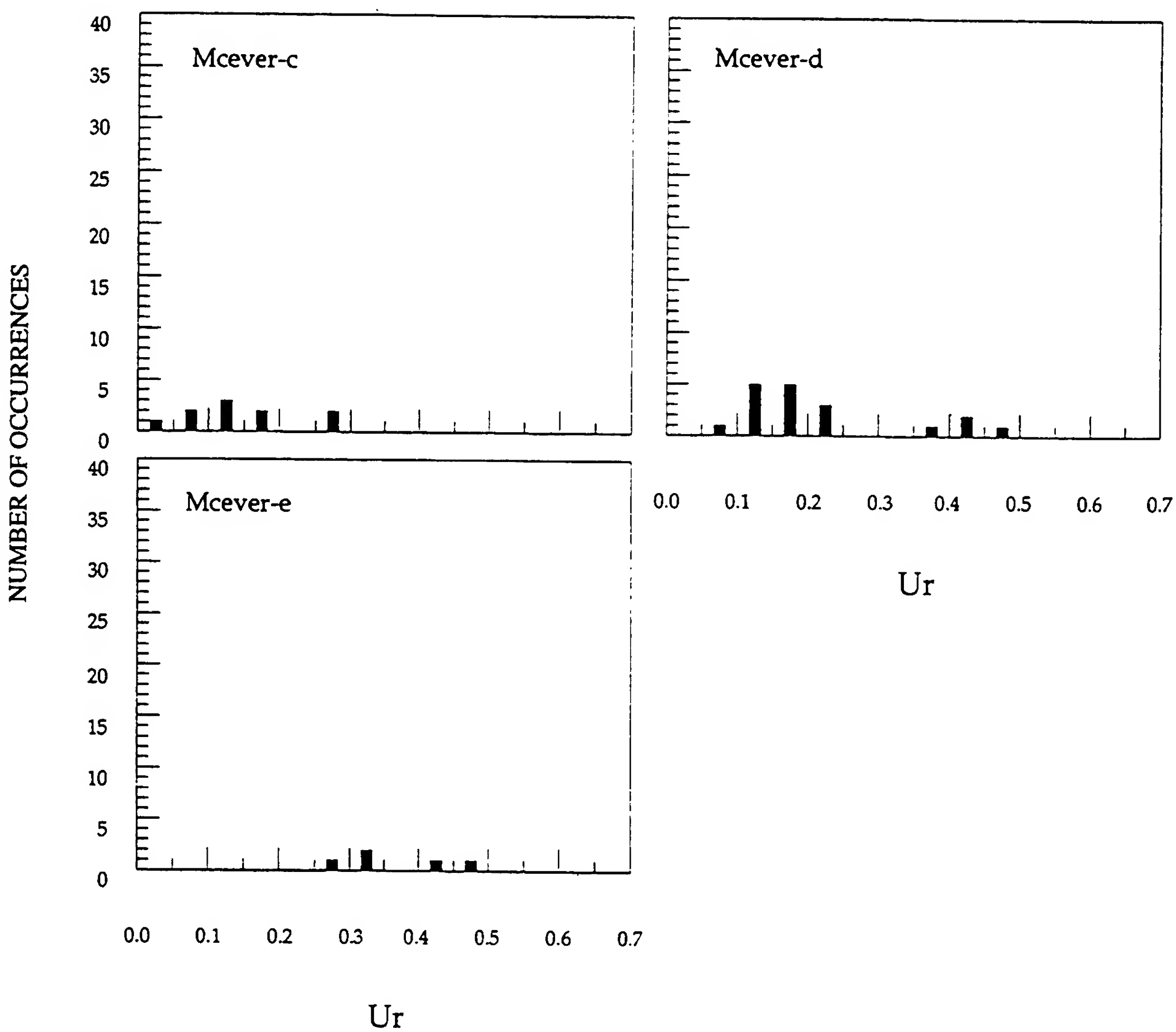
XXI-9. Histograms of $U_{r(max)}$ within various zones, Illinois River ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



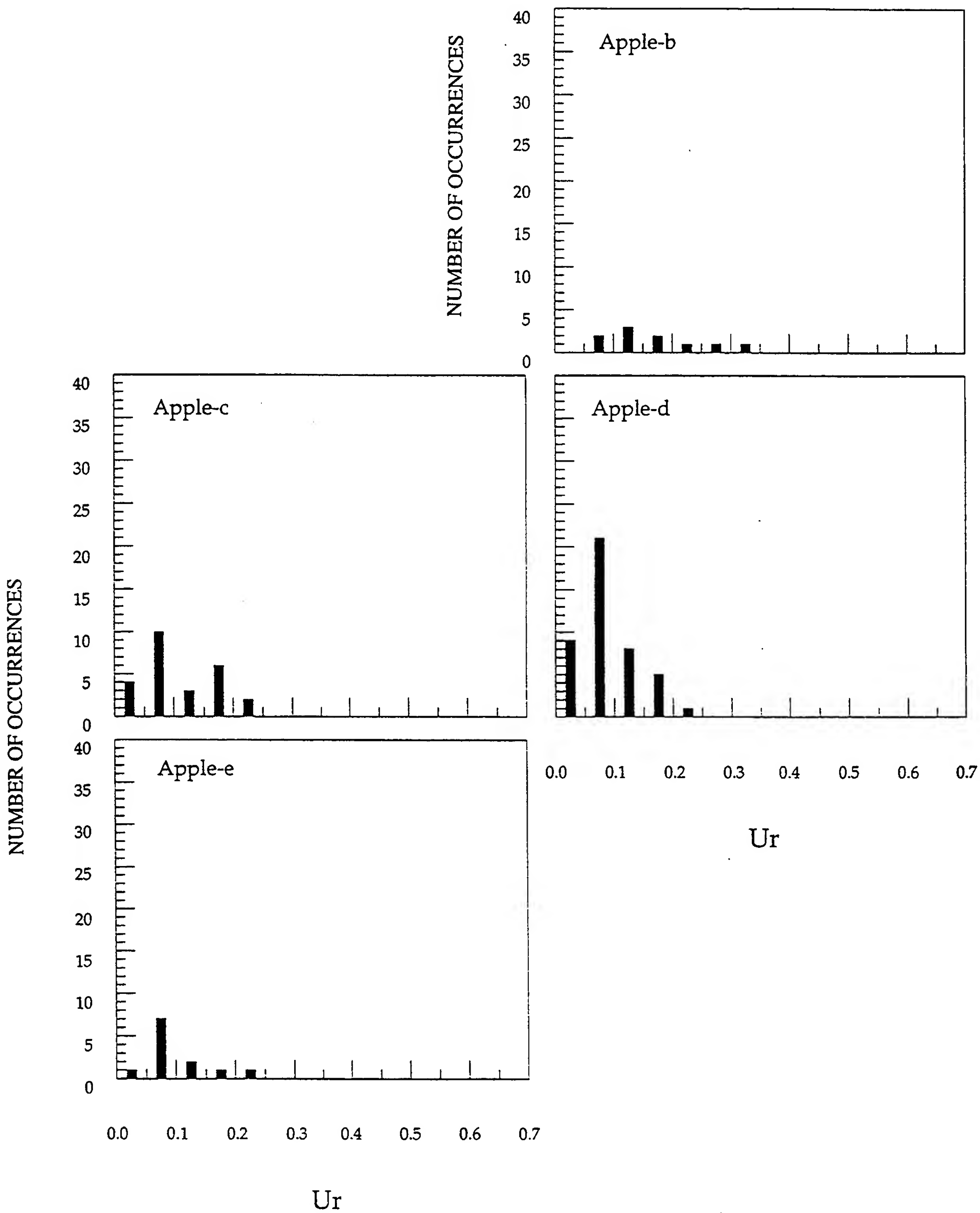
XXI-10. Histograms of $U_{r(max)}$ within various zones, Mississippi River ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



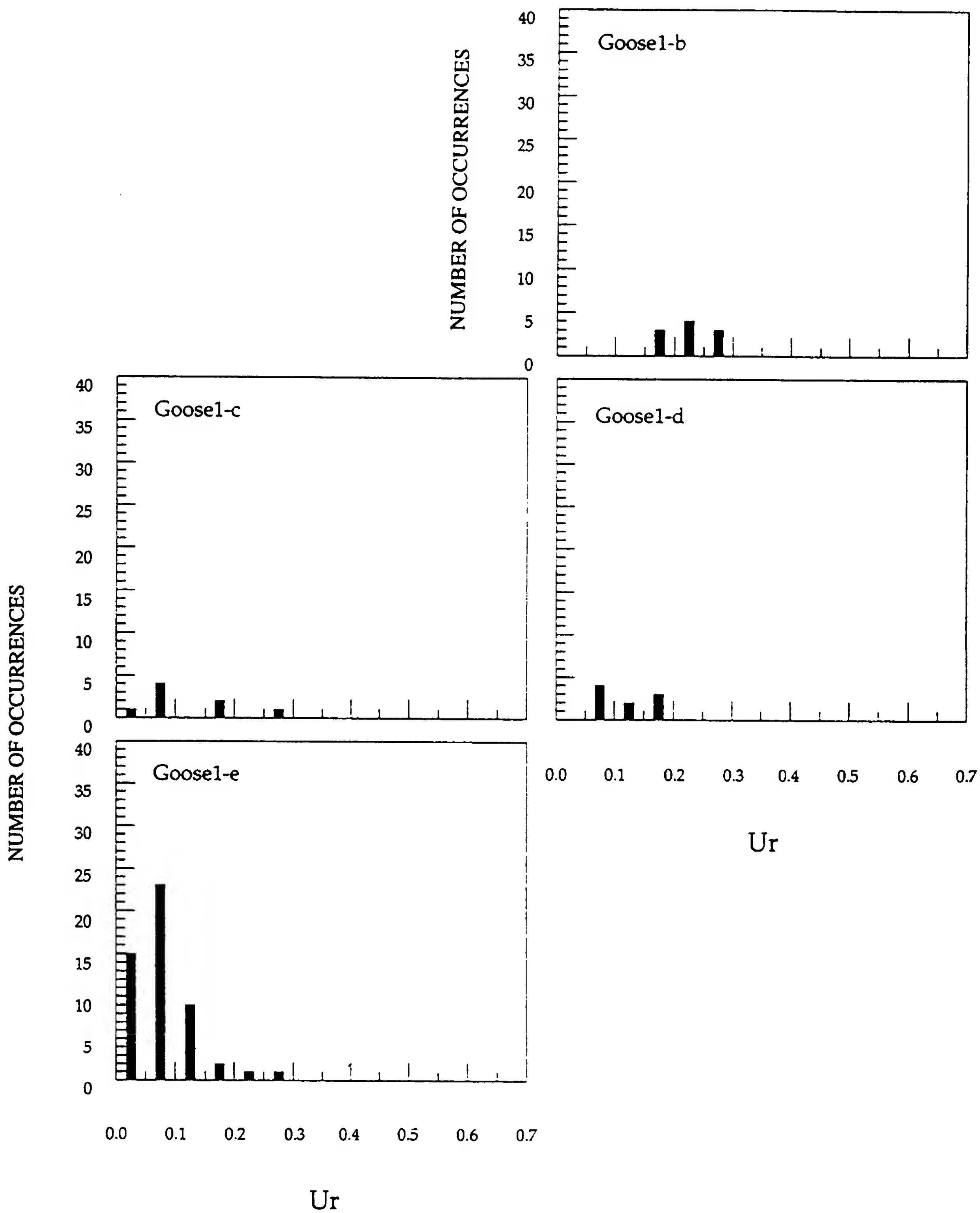
XXI-11. Histograms of $U_{r(max)}$ within various zones, Illinois and Mississippi Rivers ($U_{r(max)}$ carries signs to indicate an upstream- or downstream-bound barge effect)



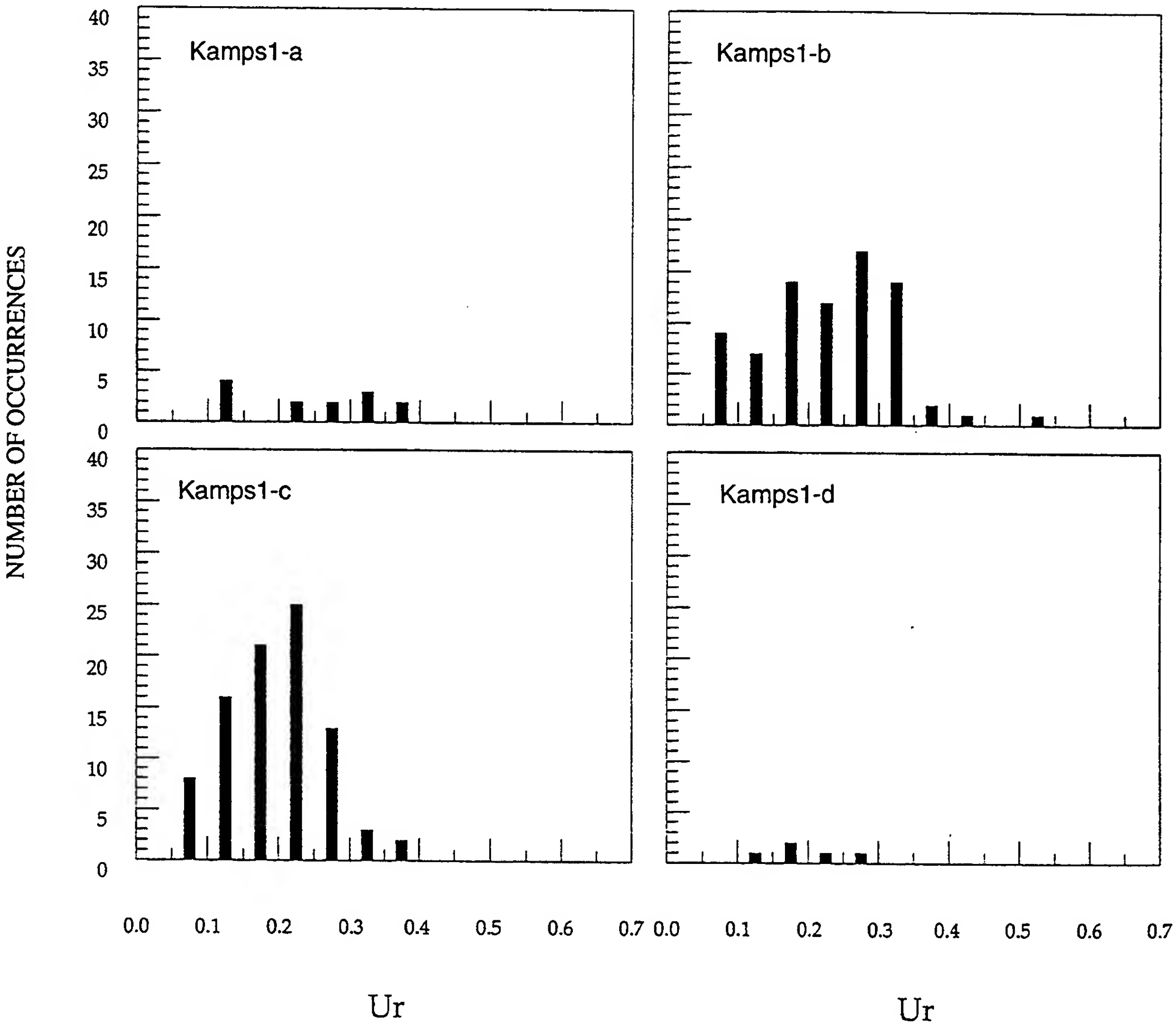
XXI-12. Histograms of absolute $U_{r(max)}$ within various zones, McEver's Island



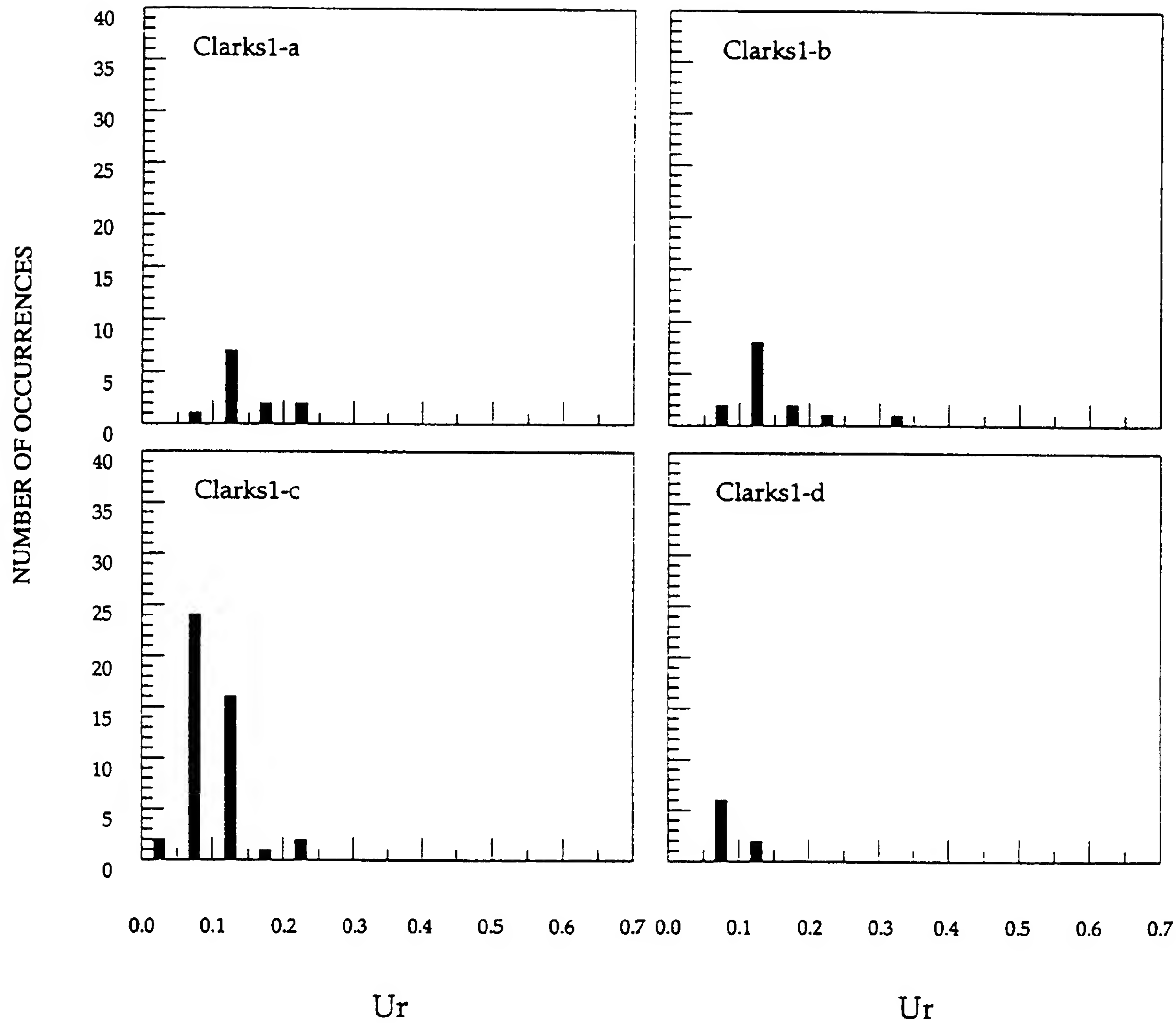
XXI-13. Histograms of absolute $U_{r(max)}$ within various zones, Apple River Island



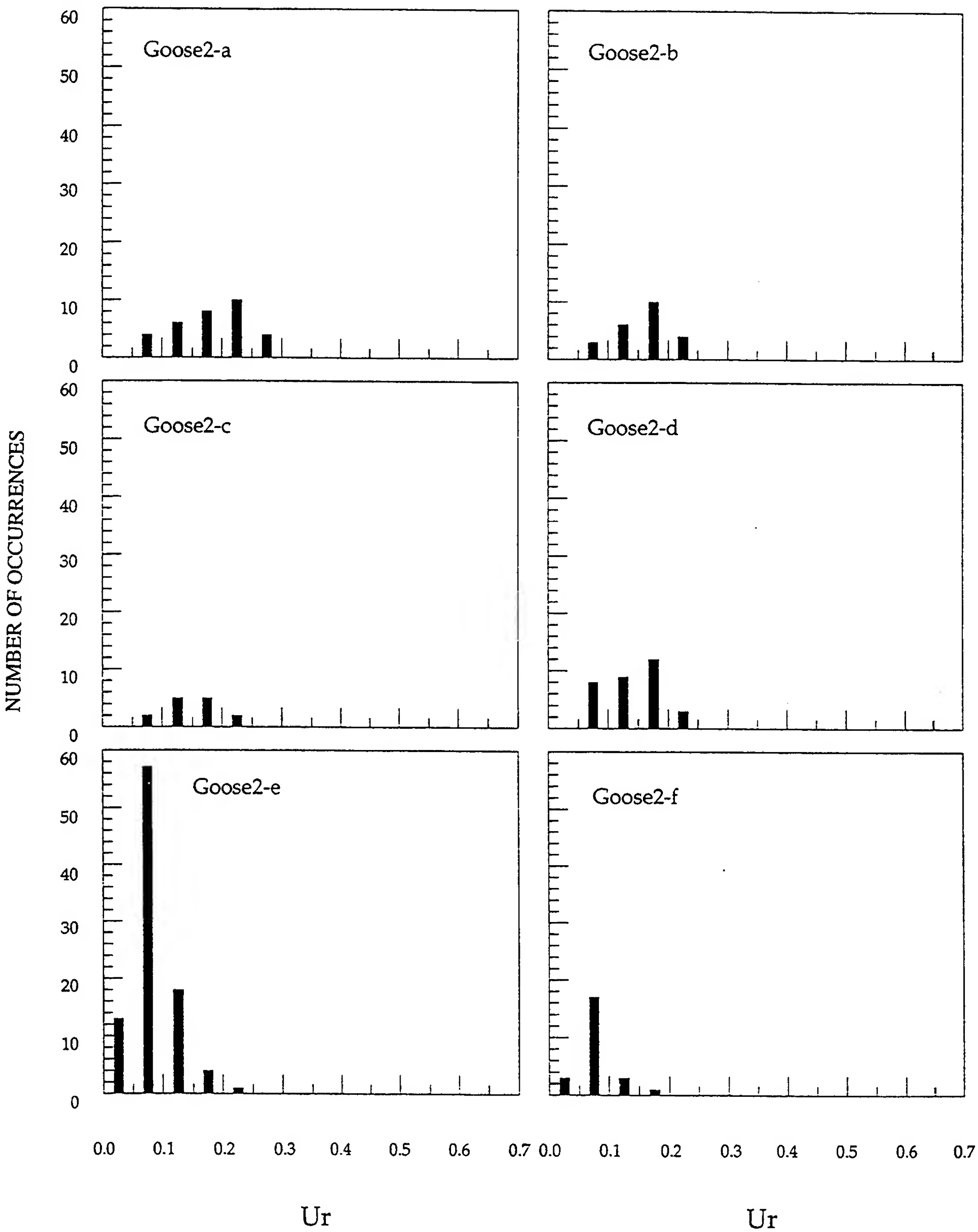
XXI-14. Histograms of absolute $U_{r(max)}$ within various zones, Goose Island, trip 1



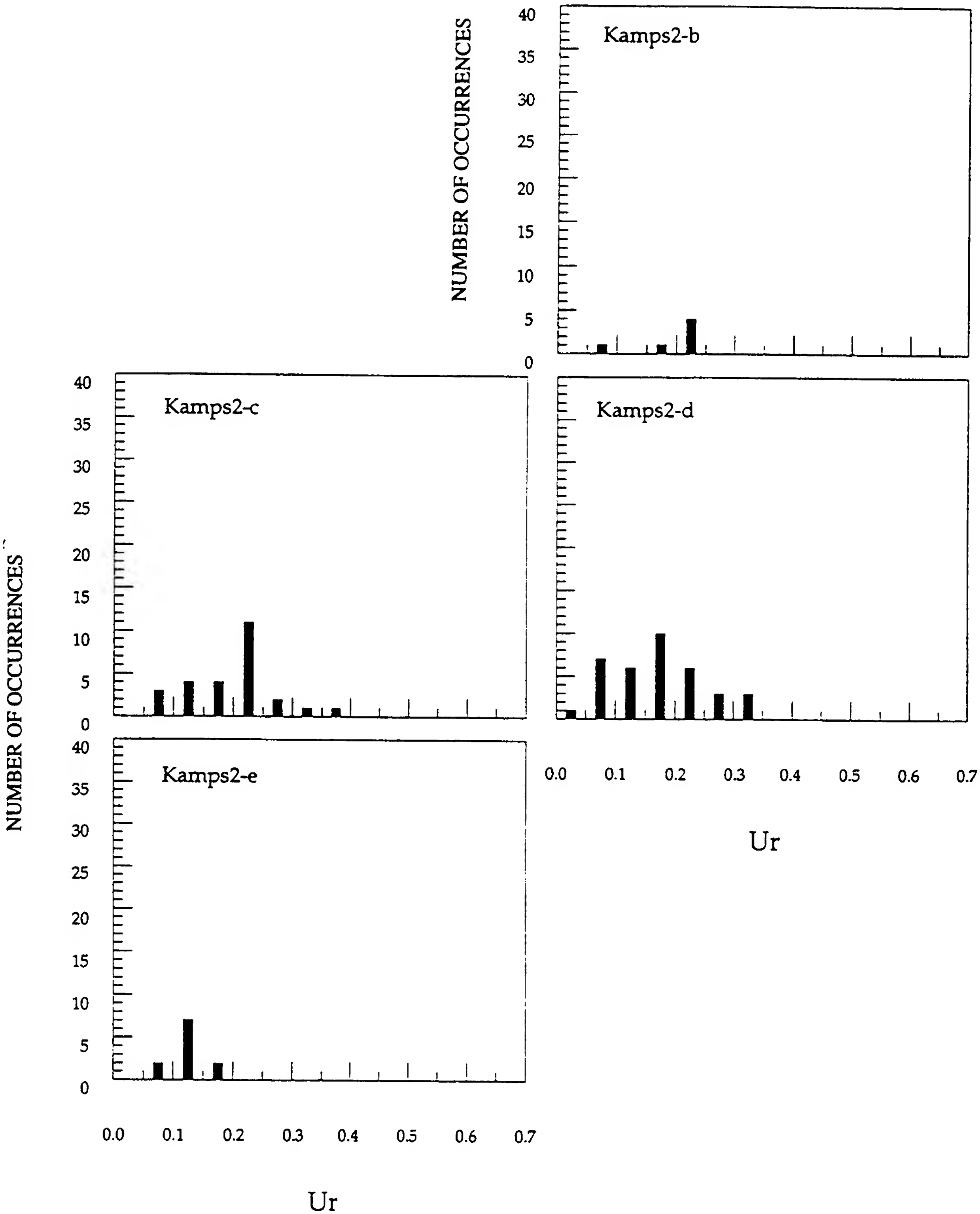
XXI-15. Histograms of absolute $U_{r(max)}$ within various zones, Kampsville, trip 1



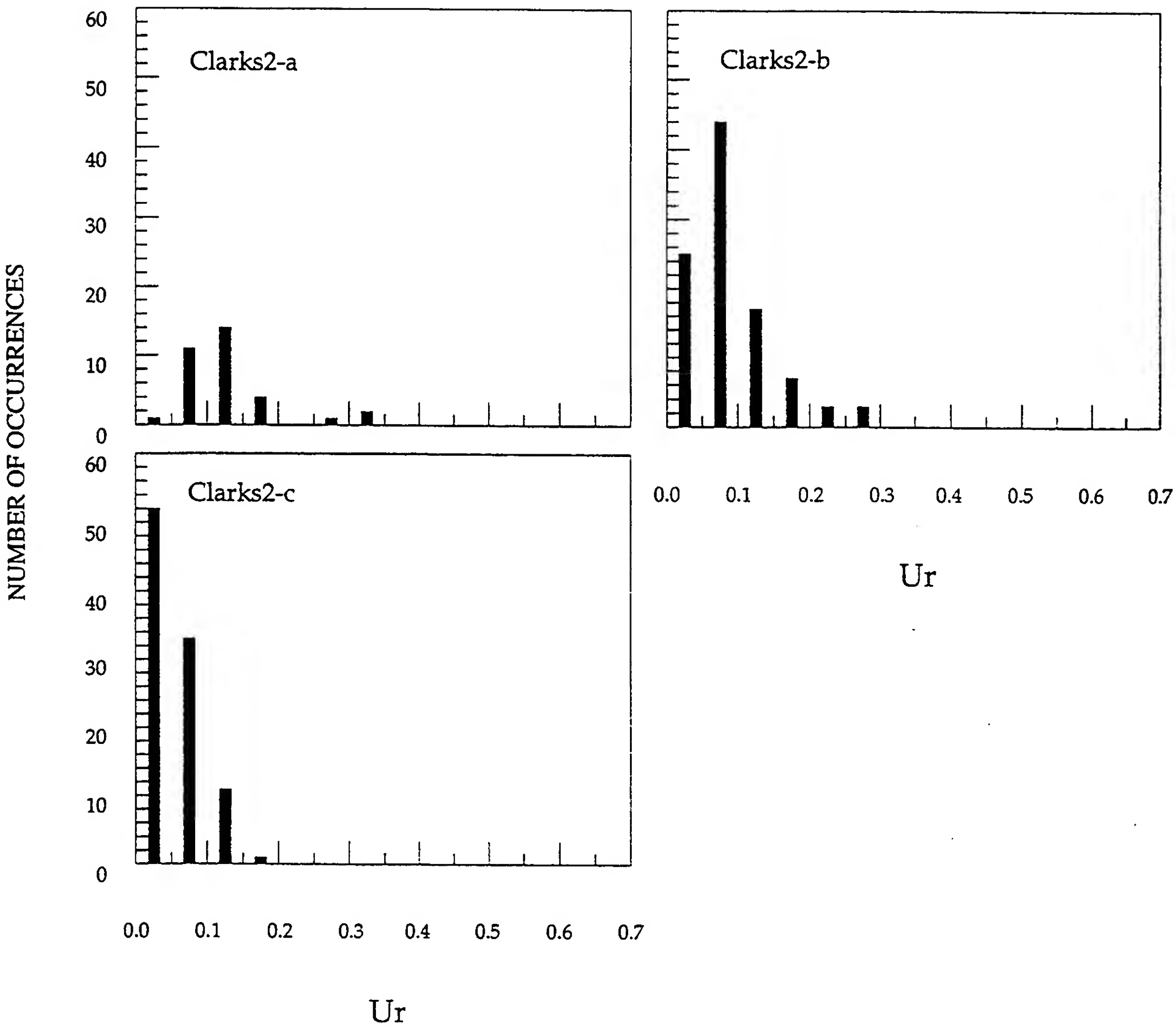
XXI-16. Histograms of absolute $U_{r(max)}$ within various zones, Clarks Ferry, trip 1



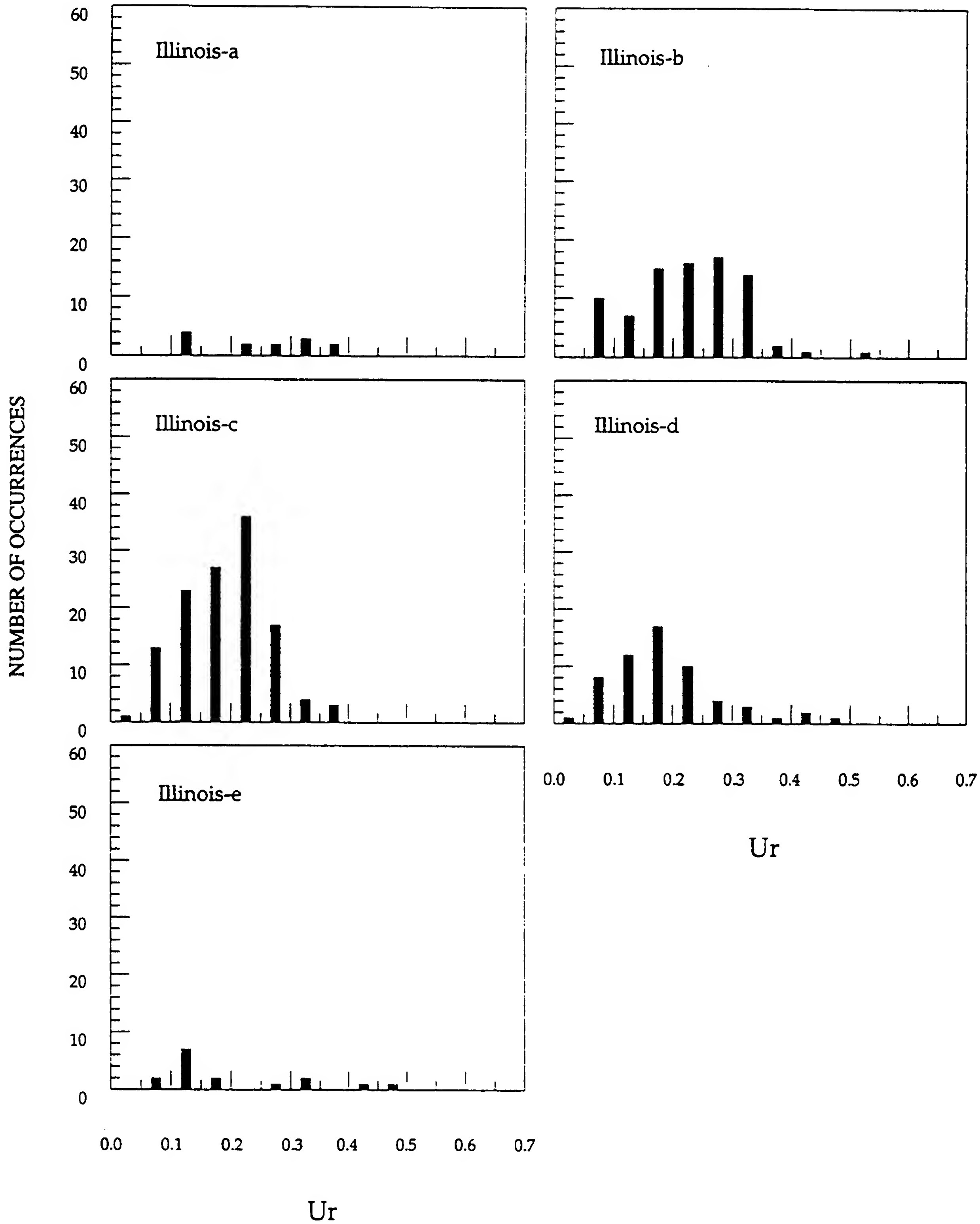
XXI-17. Histograms of absolute $U_{r(max)}$ within various zones, Goose Island, trip 2



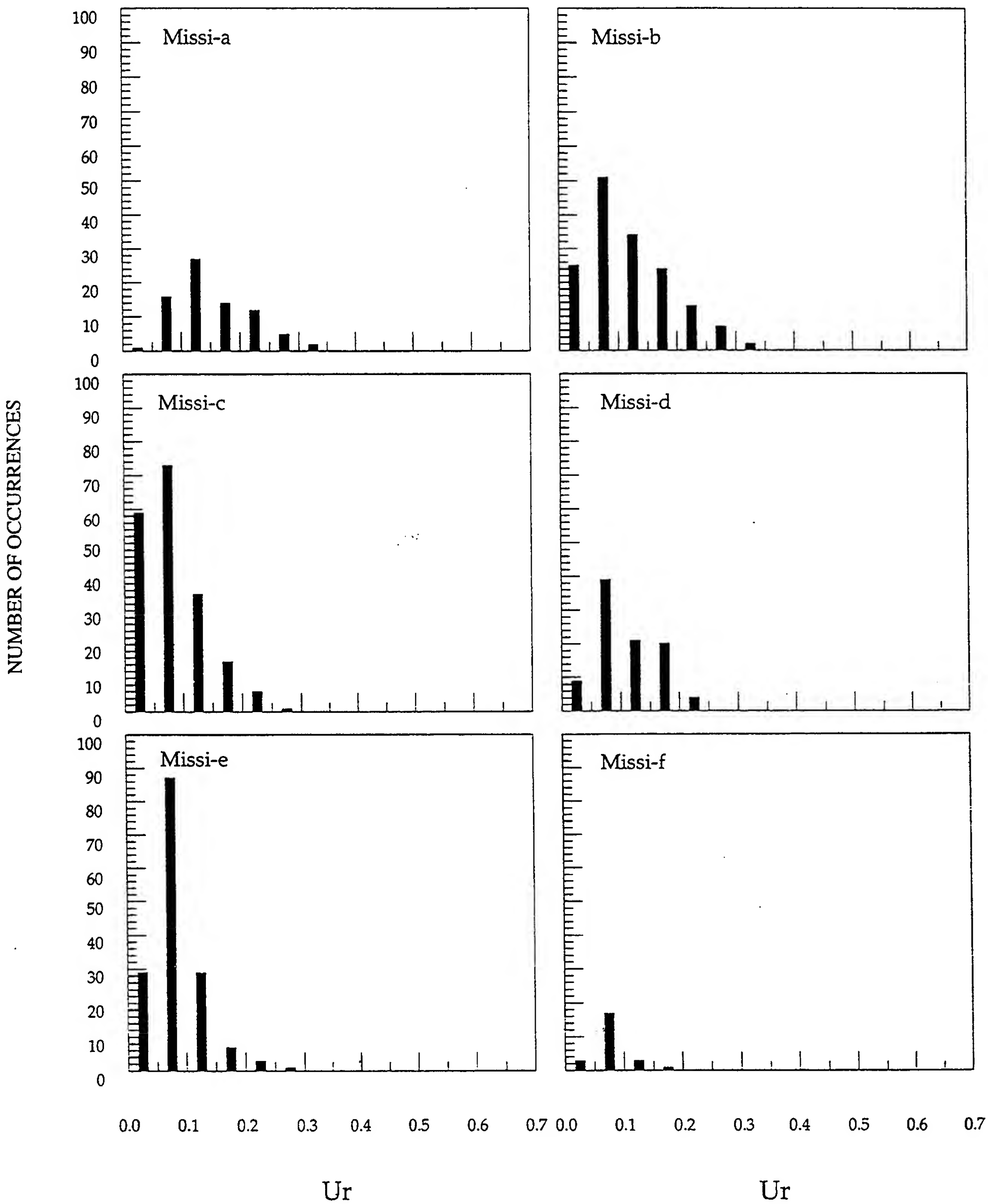
XXI-18. Histograms of absolute $U_{r(max)}$ within various zones, Kampsville, trip 2



XXI-19. Histograms of absolute $U_{r(max)}$ within various zones, Clarks Ferry, trip 2



XXI-20. Histograms of absolute $U_{r(max)}$ within various zones, Illinois River



XXI-21. Histograms of absolute $U_{r(max)}$ within various zones, Mississippi River

APPENDIX XXII.

SAMPLE PLOTS OF WAVES AND DRAWDOWN GENERATED BY NAVIGATION TRAFFIC

Jeff Boat

At: Kampsville (1)

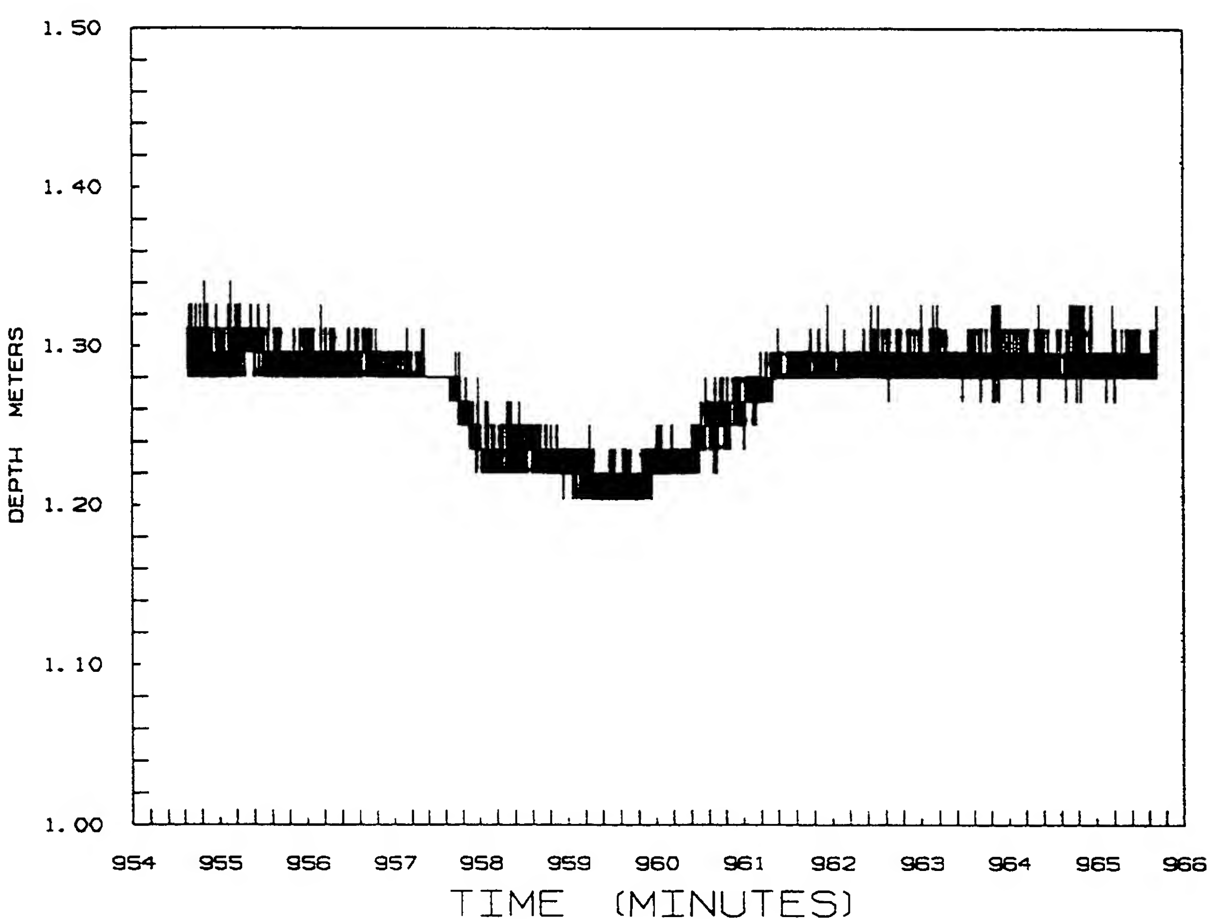
date:10/14/90

time:15:57

MEAN = 1.29

VMAX = 1.34 TMAX = 954.84

VMIN = 1.20 TMIN = 958.95



XXII-1. Measured drawdown and waves for barge *Jeff Boat* at Kampsville, trip 1

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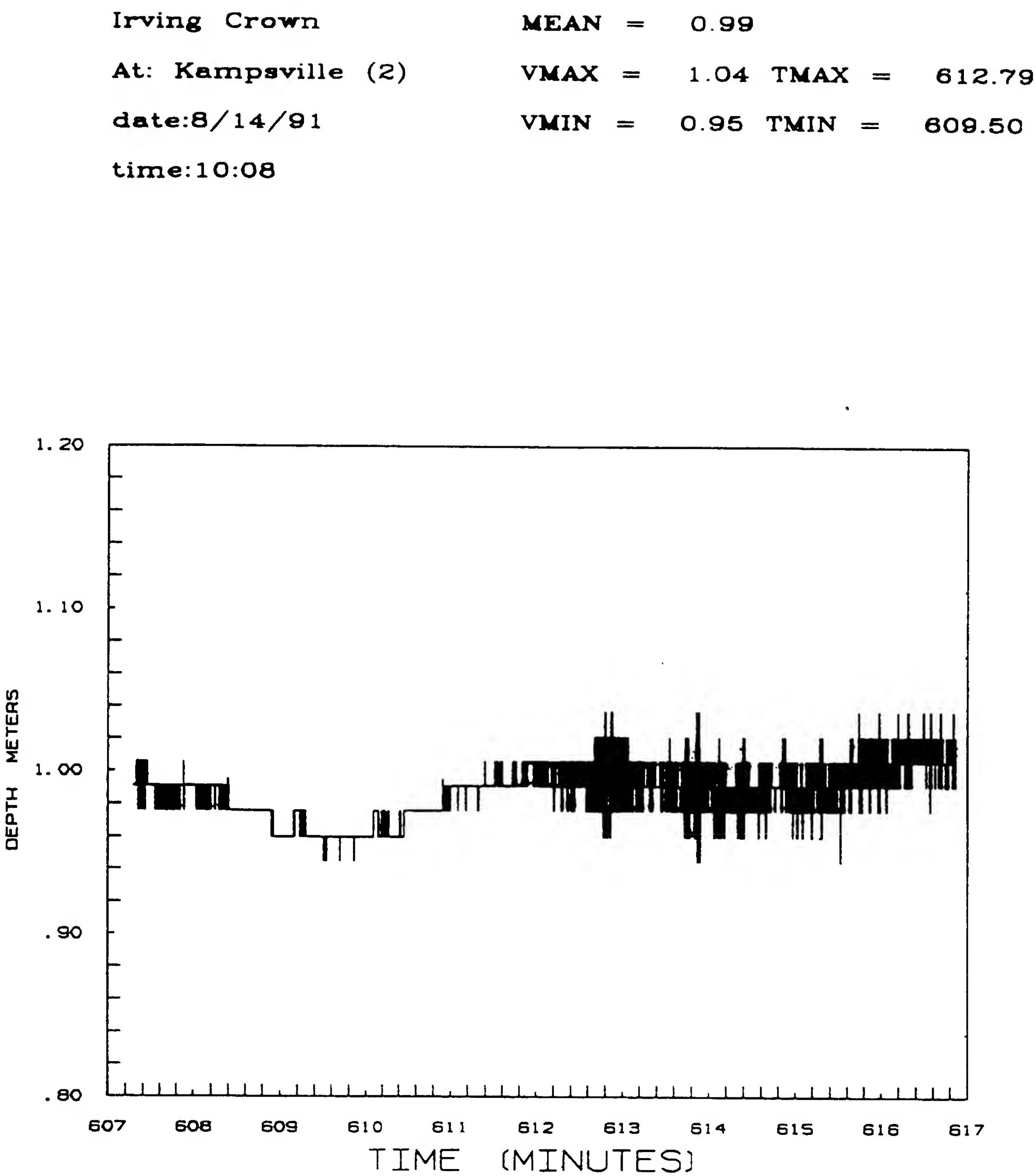


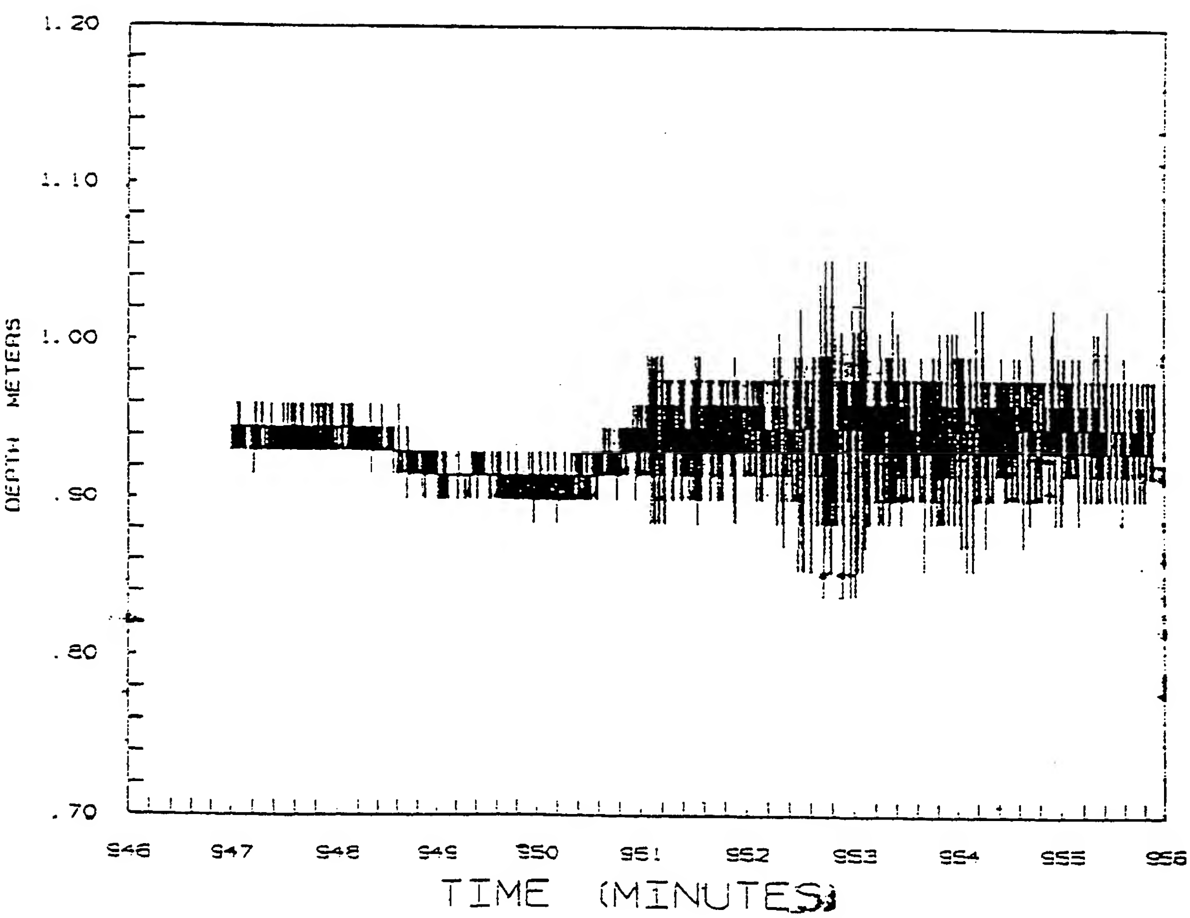
XXII-2. Measured drawdown and waves for barge *Irving Crown* at Kampsville, trip 2

American Beauty MEAN = 0.94

At: Clarks Ferry (1) VMAX = 1.05 TMAX = 952.73

date:05/20/91 VMIN = 0.84 TMIN = 952.71

time:15:48:23



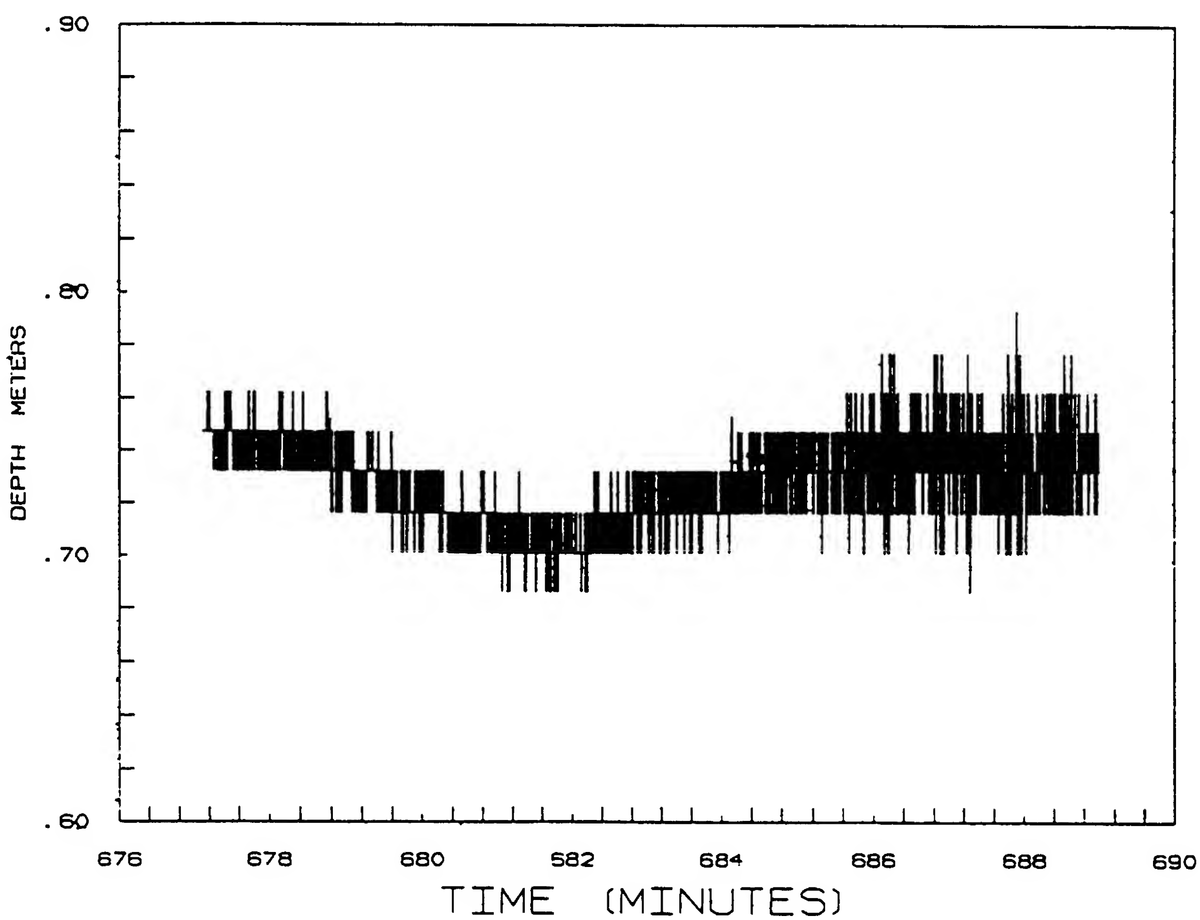
XXII-3. Measured drawdown and waves for barge *American Beauty* at Clarks Ferry, trip 1

Hugh C. Blaske — MEAN = 0.74

At: Goose Island — VMAX = 0.79 TMAX = 687.90

date:08/25/90 — VMIN = 0.69 TMIN = 681.06

time:11:19



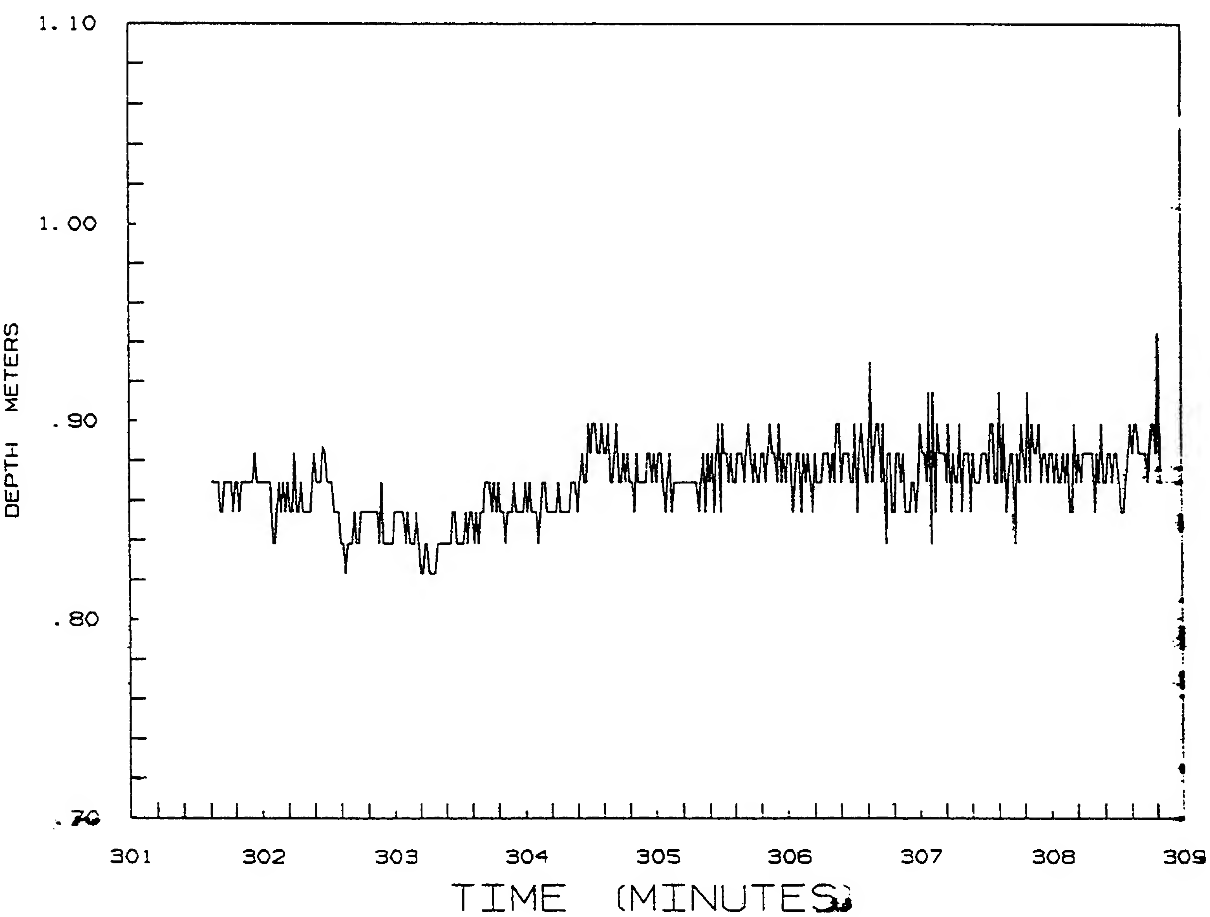
XXII-4. Measured drawdown and waves for barge *Hugh C. Blaske* at Goose Island, trip 1

James F. Neal — MEAN = 0.63

At: Goose Island — VMAX = 0.95 TMAX = 308.81

date:07/18/91 — VMIN = 0.82 TMIN = 302.64

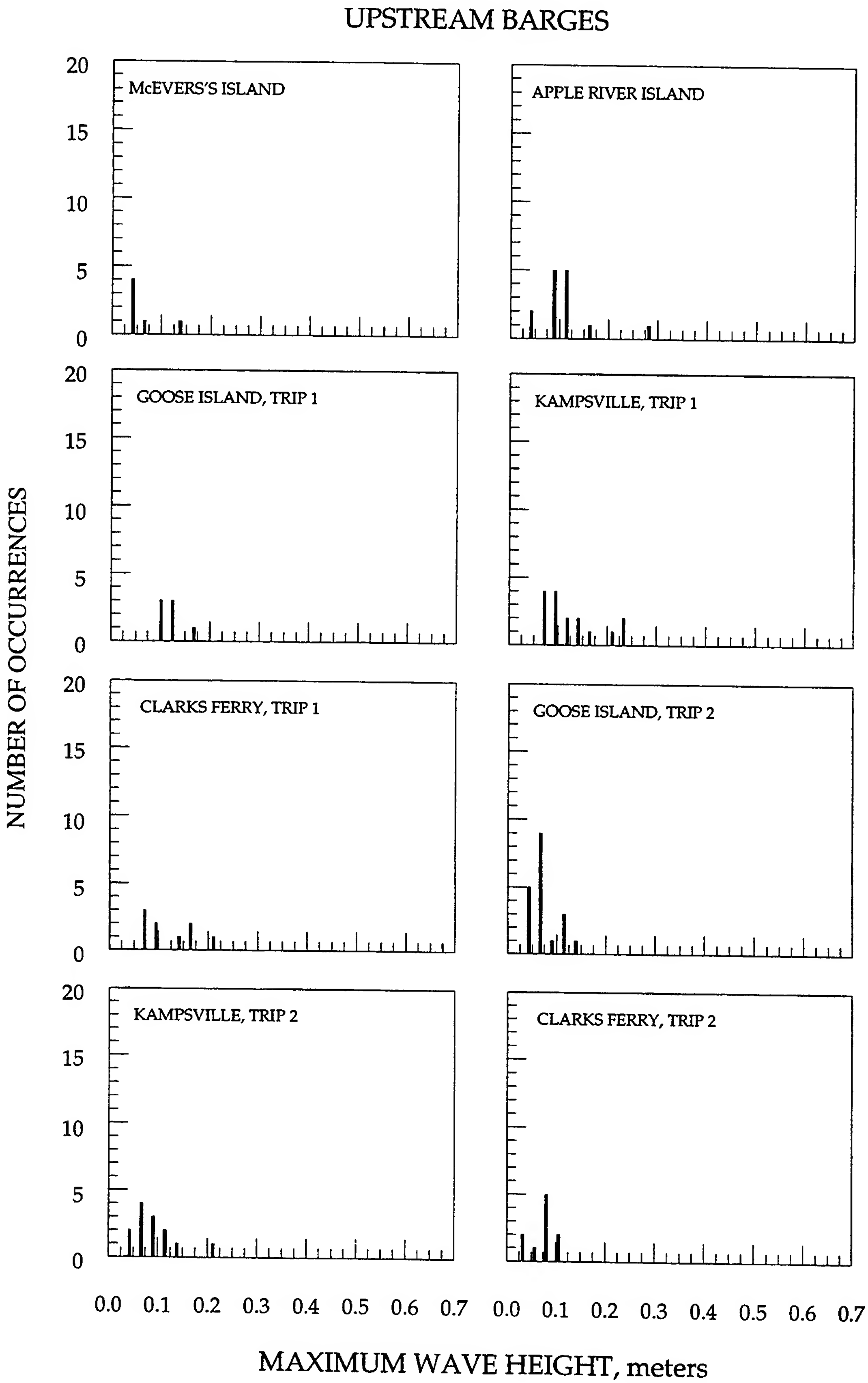
time:14:17



XXII-5. Measured drawdown and waves for barge *James F. Neal* at Goose Island, trip 2

APPENDIX XXIII.

HISTOGRAMS OF MAXIMUM WAVE HEIGHT



XXIII-1. Histograms of maximum wave height, upstream barges

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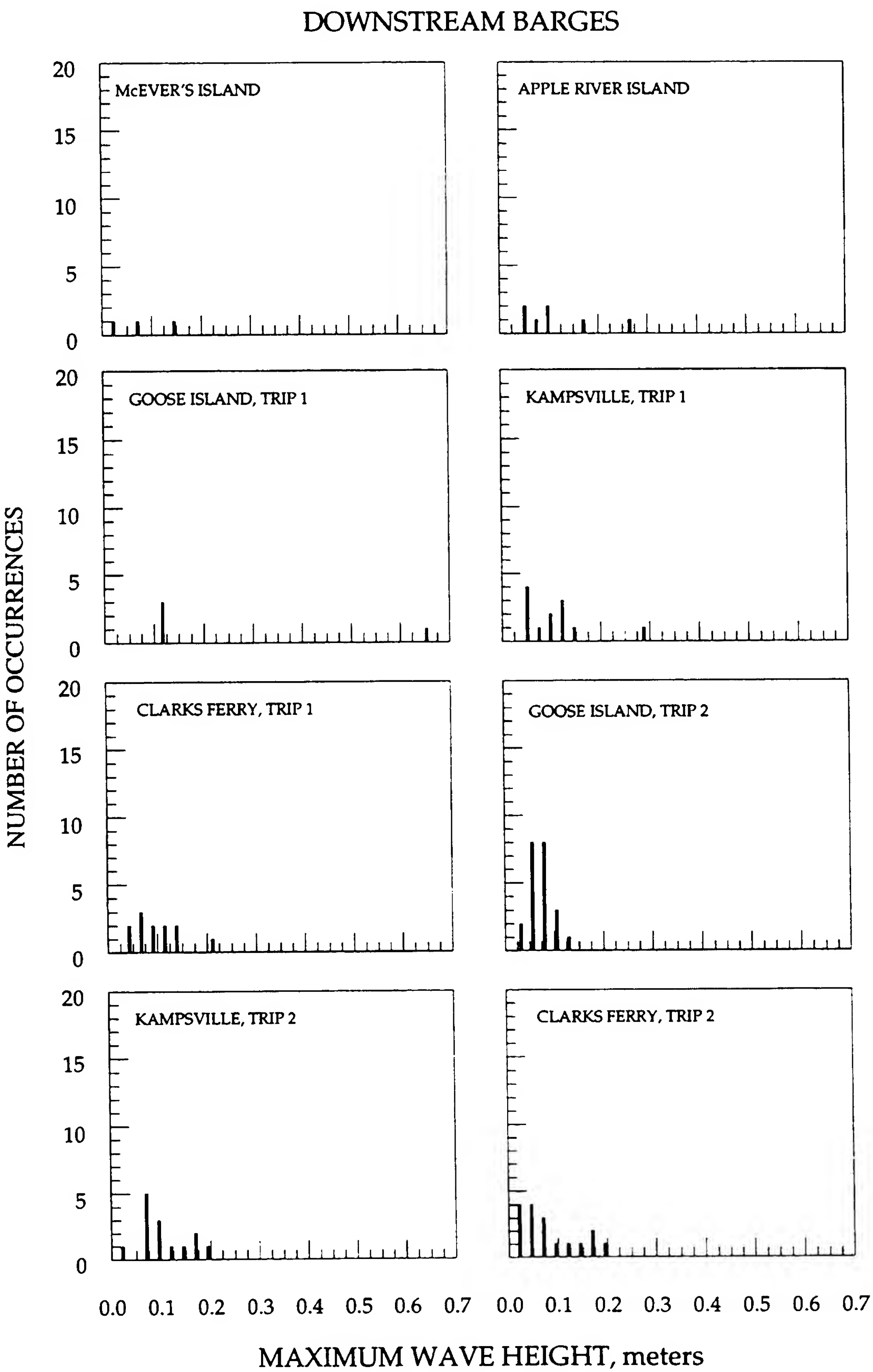
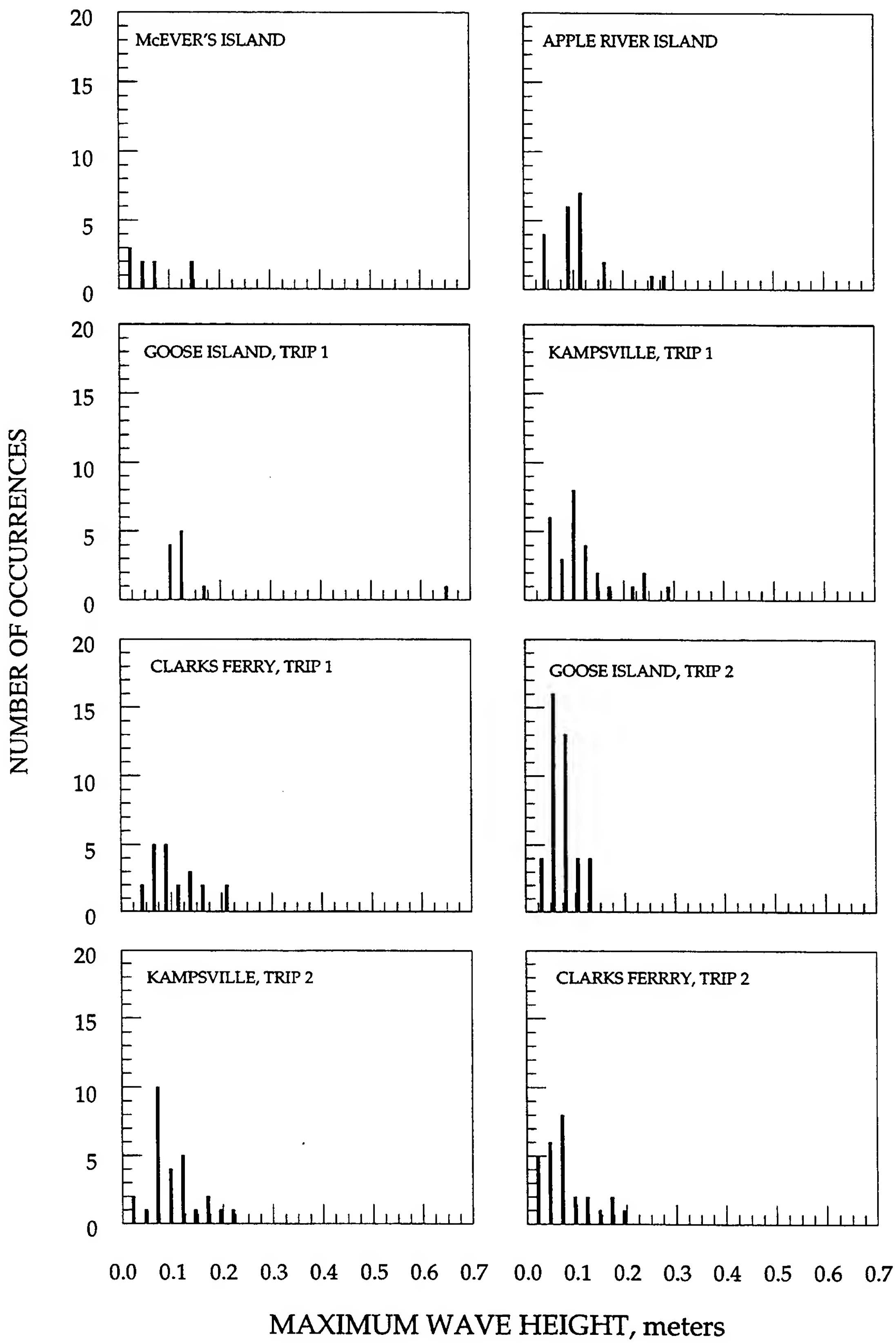
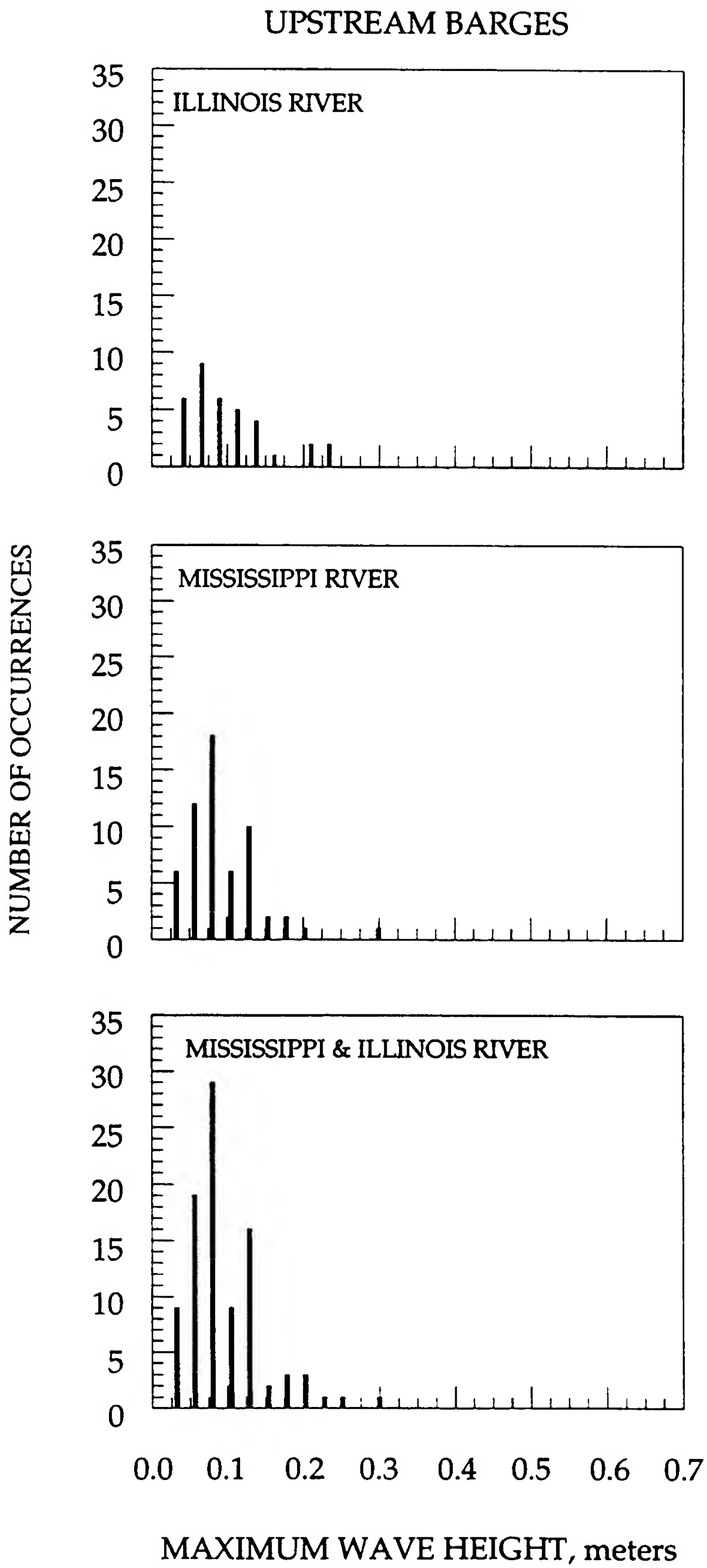


XXIII-2. Histograms of maximum wave height, downstream barges

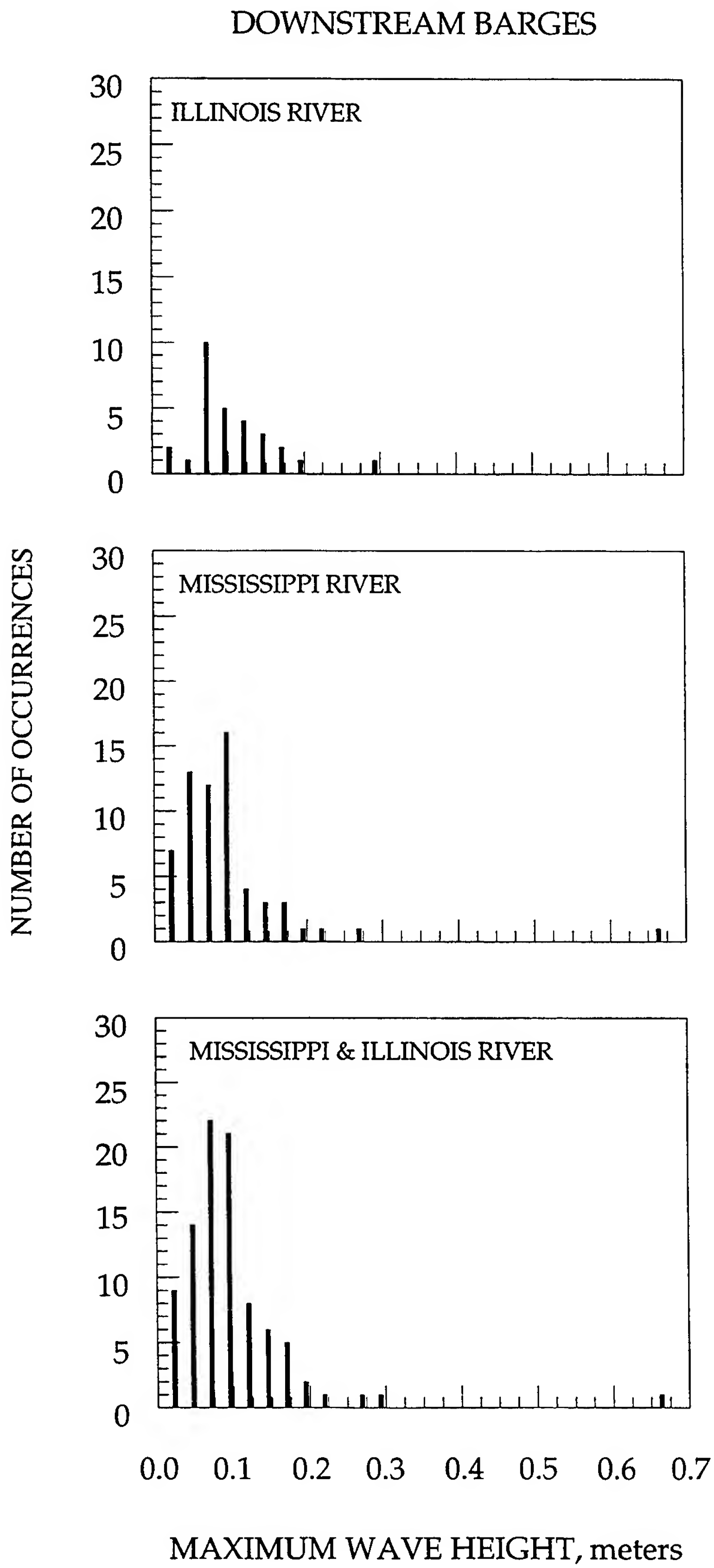
ALL BARGES



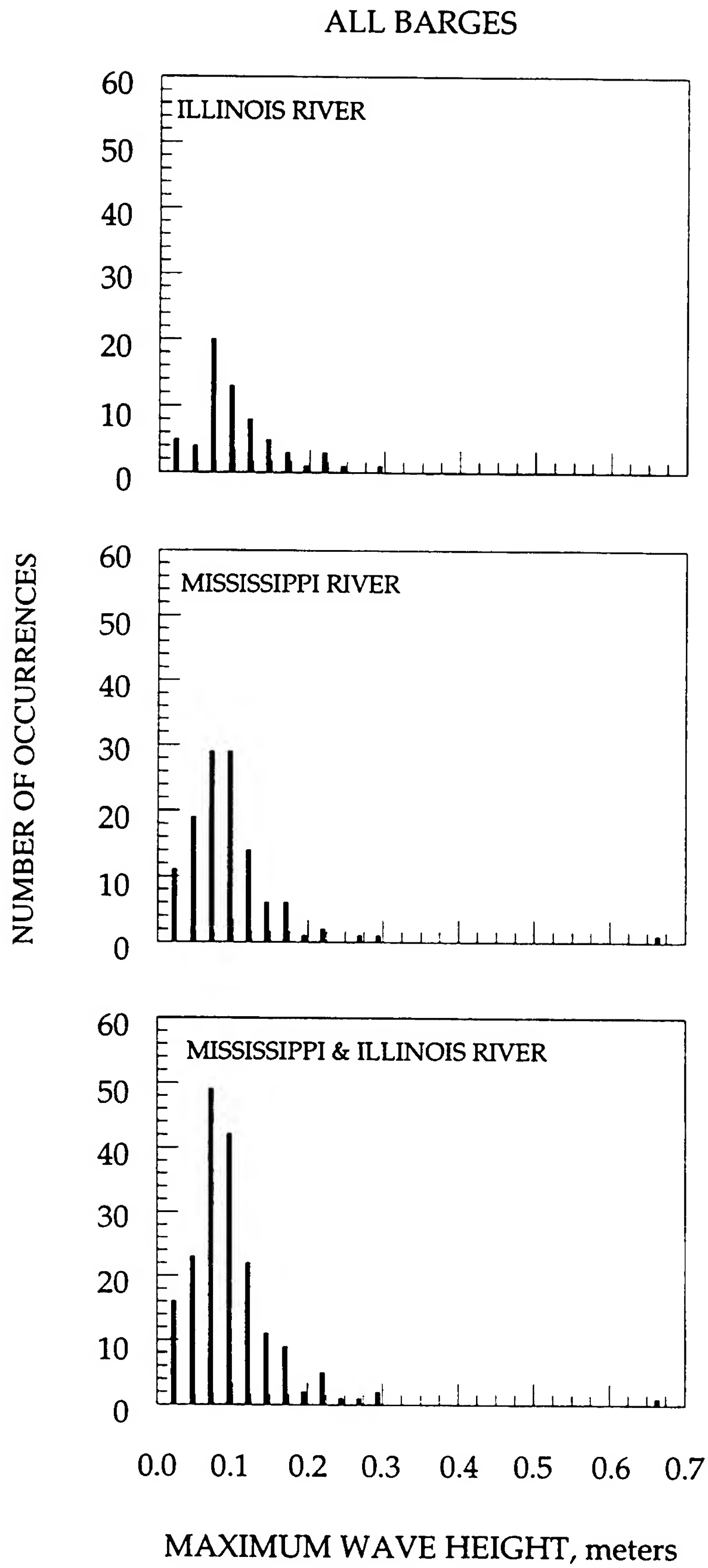
XXIII-3. Histograms of maximum wave height, all barges



XXIII-4. Histograms of maximum wave height for the river system, upstream barges



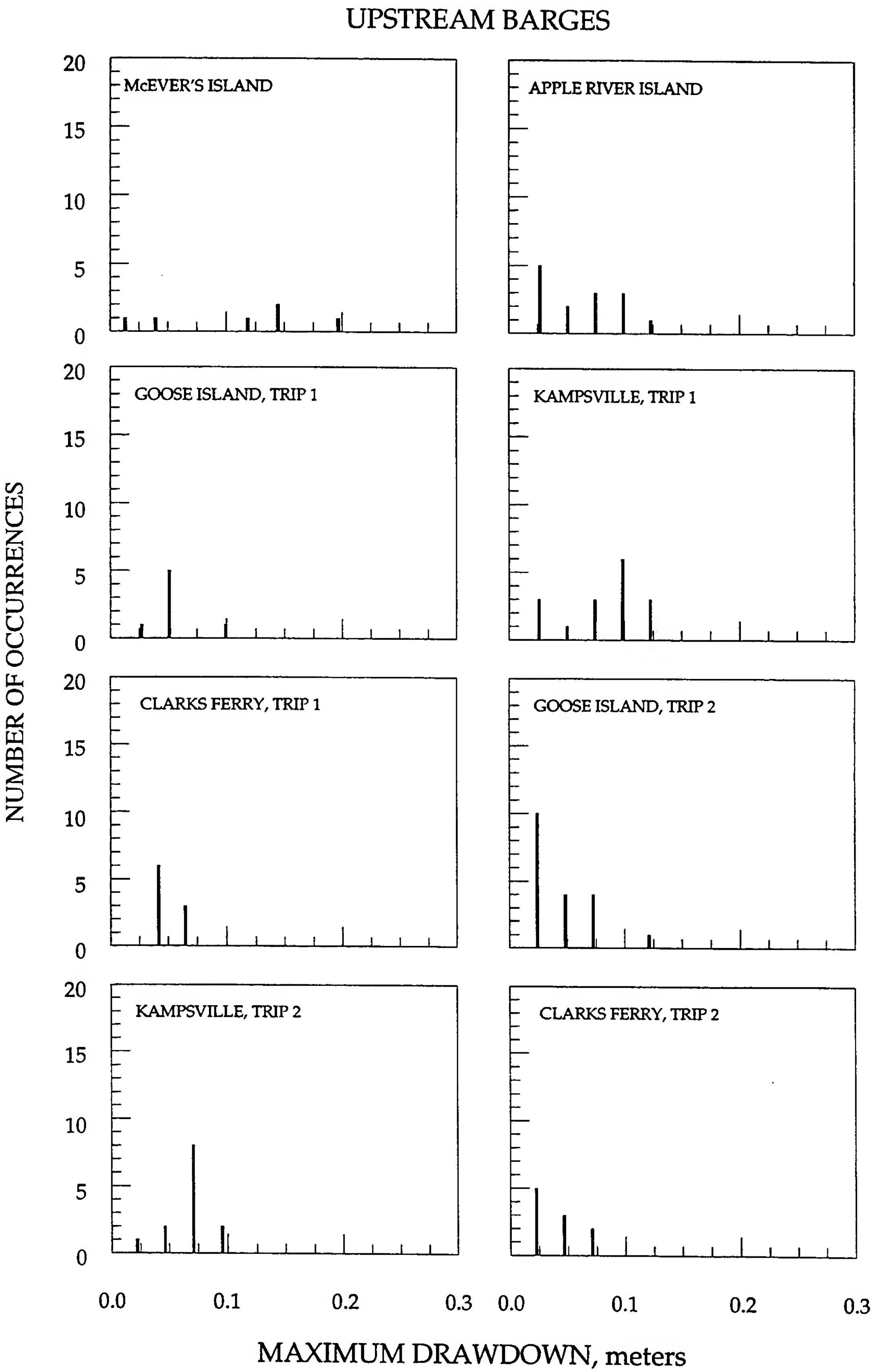
XXIII-5. Histograms of maximum wave height for the river system, downstream barges



XXIII-6. Histograms of maximum wave height for the river system, all barges

APPENDIX XXIV.

HISTOGRAMS OF MAXIMUM DRAWDOWN



XXIV-1. Histograms of maximum drawdown, upstream barges

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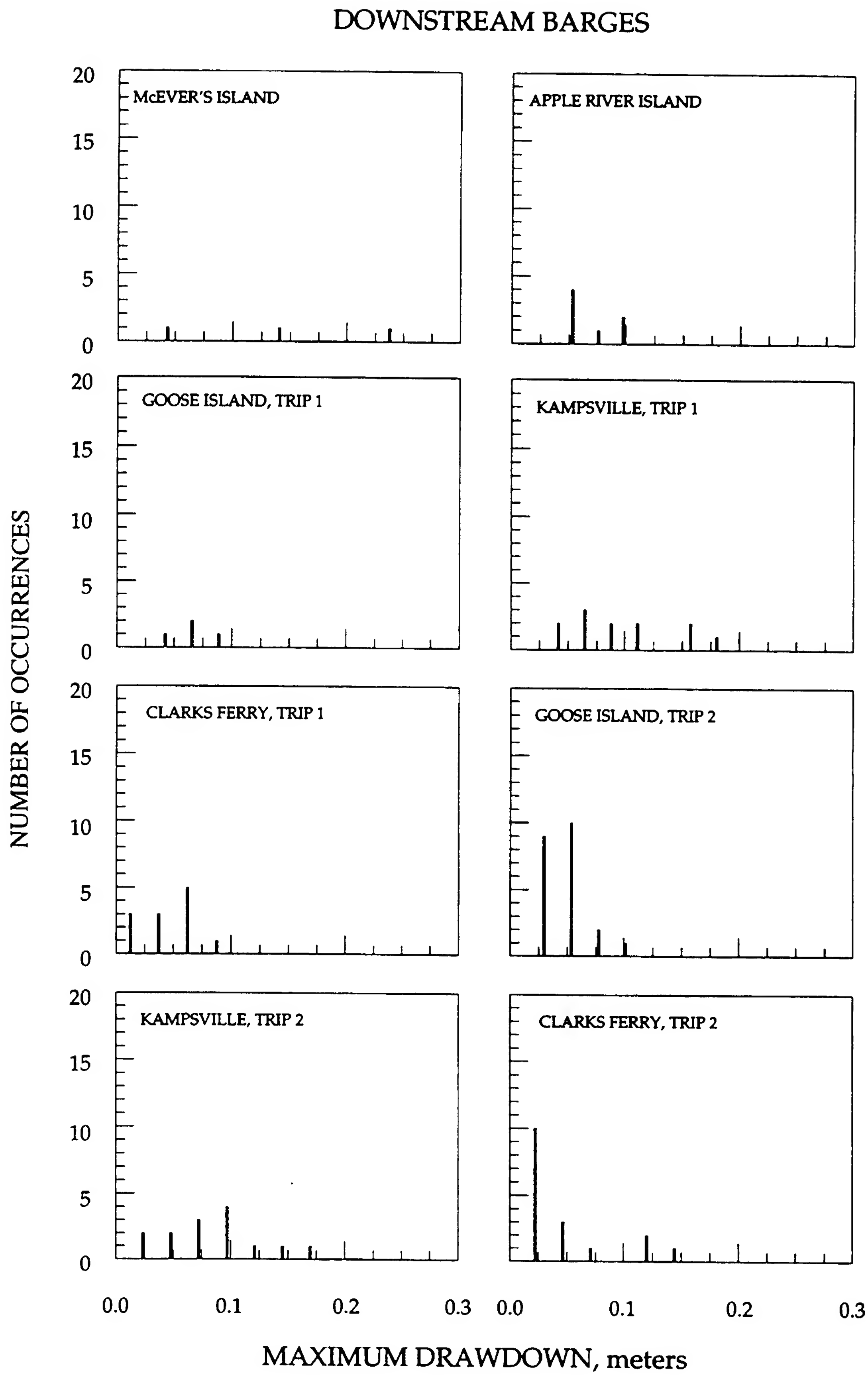
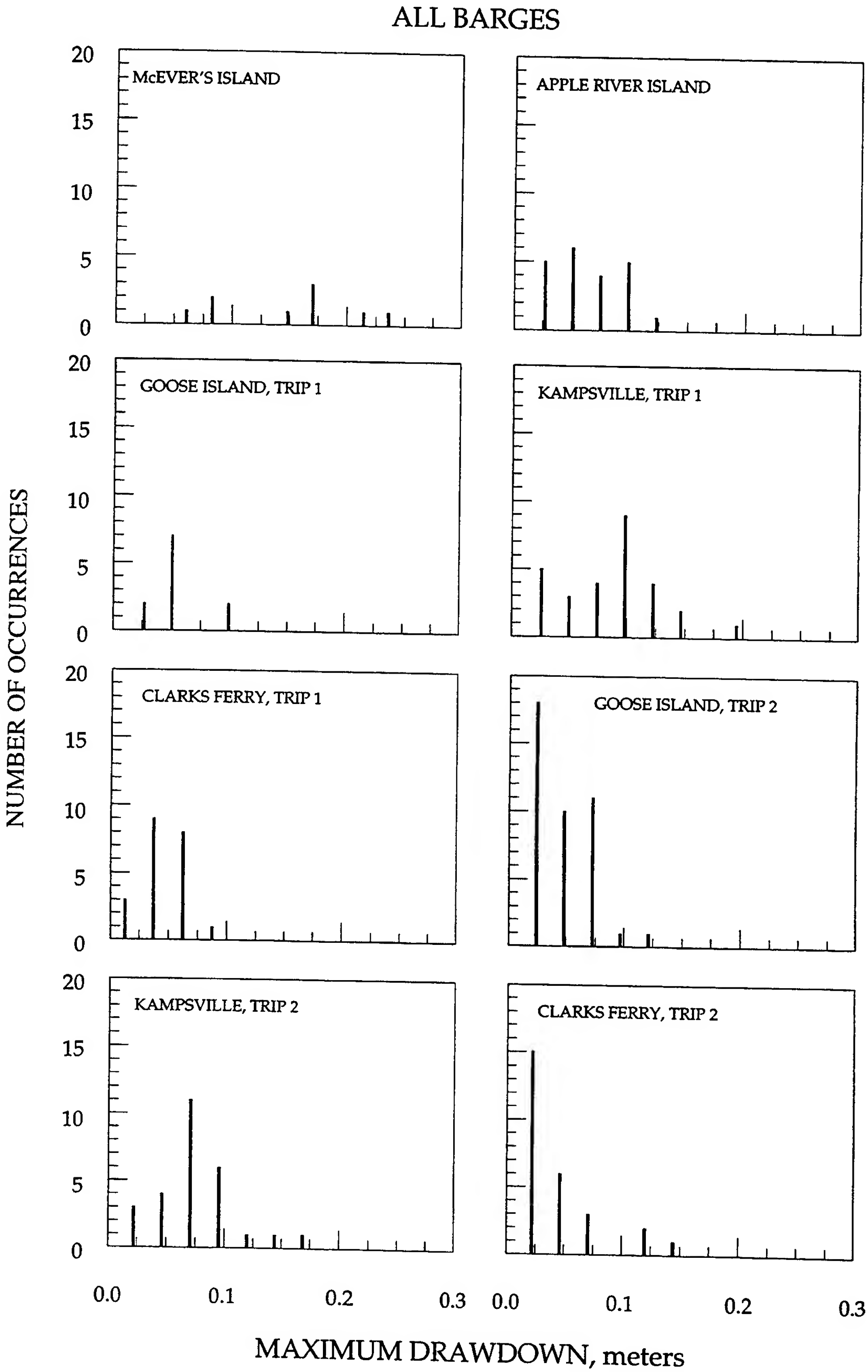
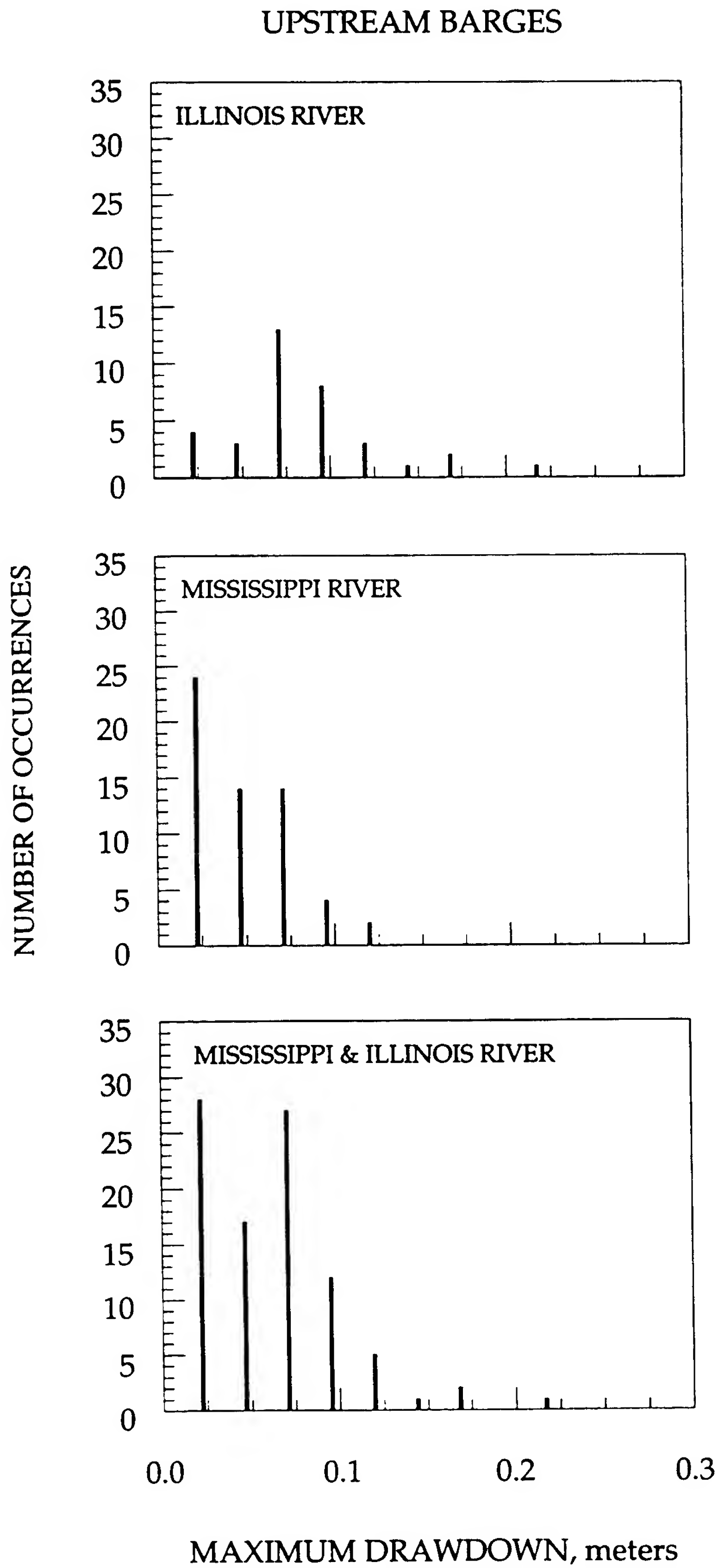


XXIV-2. Histograms of maximum drawdown, downstream barges

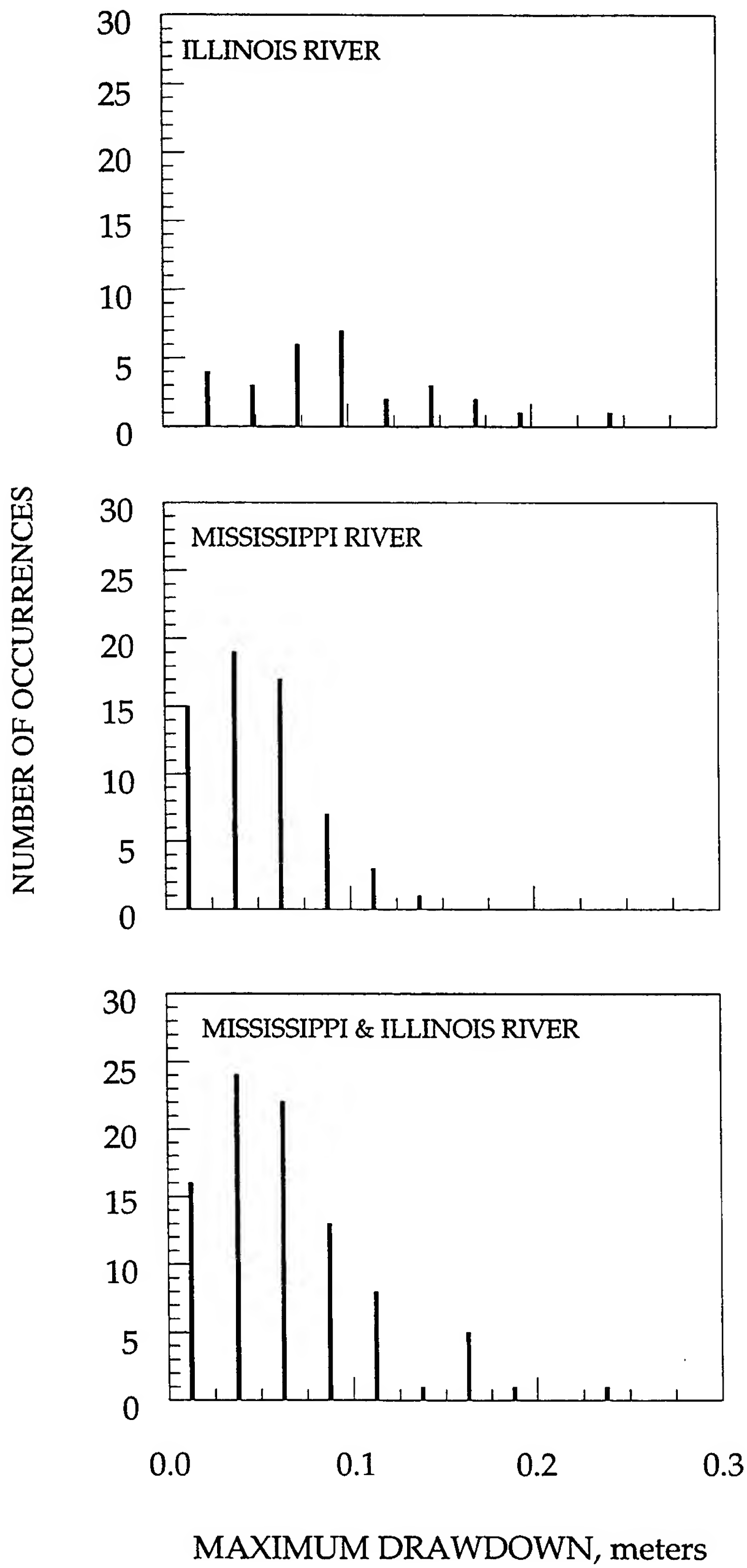


XXIV-3. Histograms of maximum drawdown, all barges

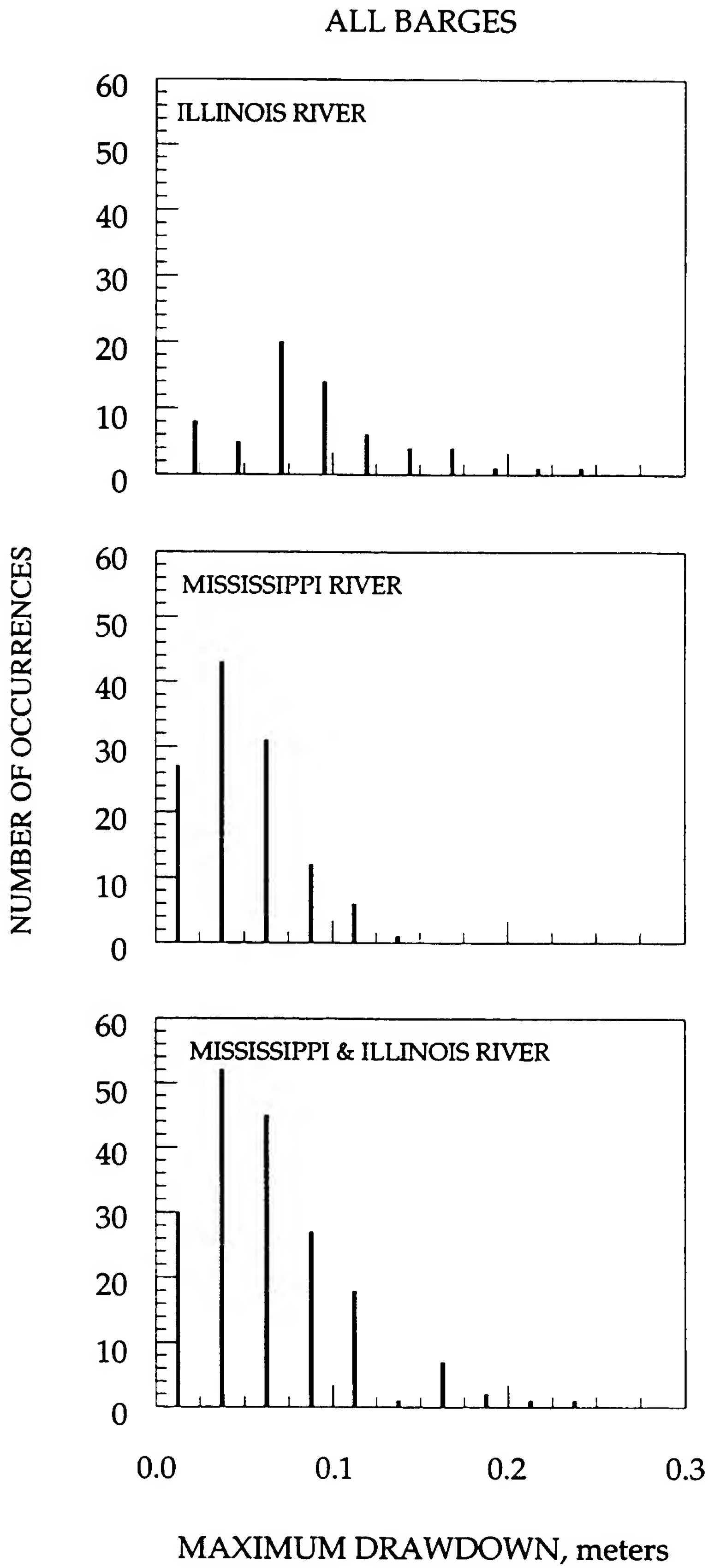


XXIV-4. Histograms of maximum drawdown for the river system, upstream barges

DOWNSTREAM BARGES



XXIV-5. Histograms of maximum drawdown for the river system, downstream barges



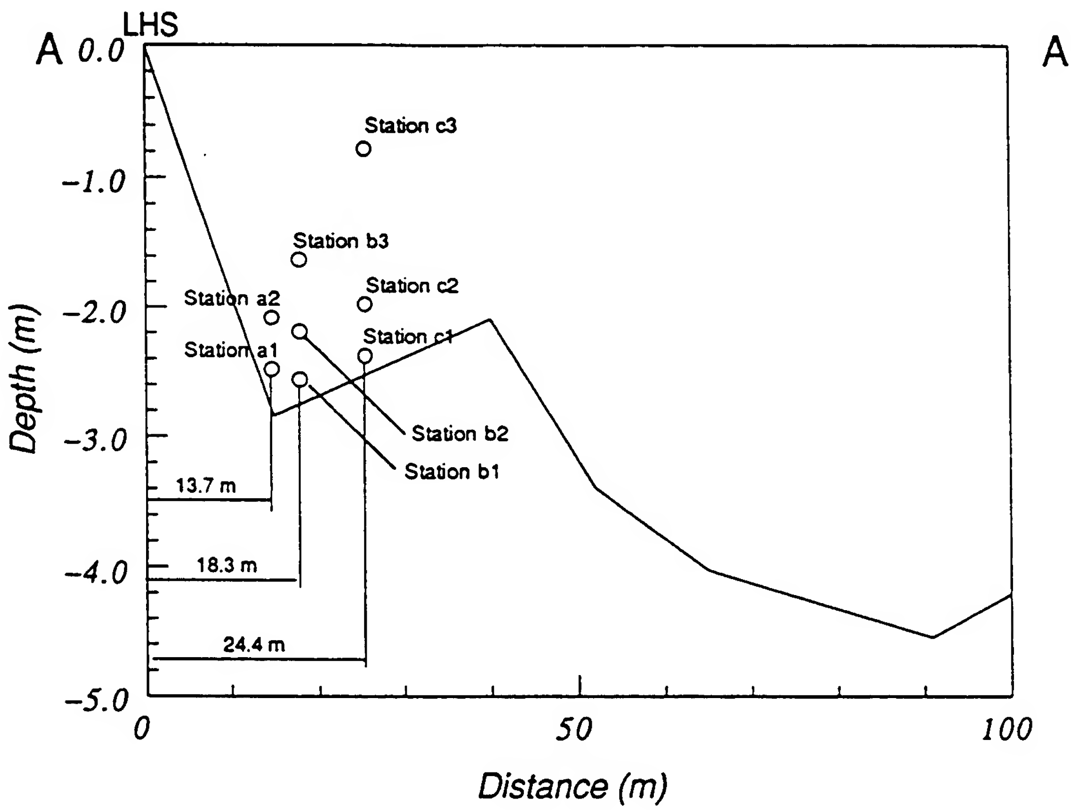
XXIV-6. Histograms of maximum drawdown for the river system, all barges

APPENDIX XXV.

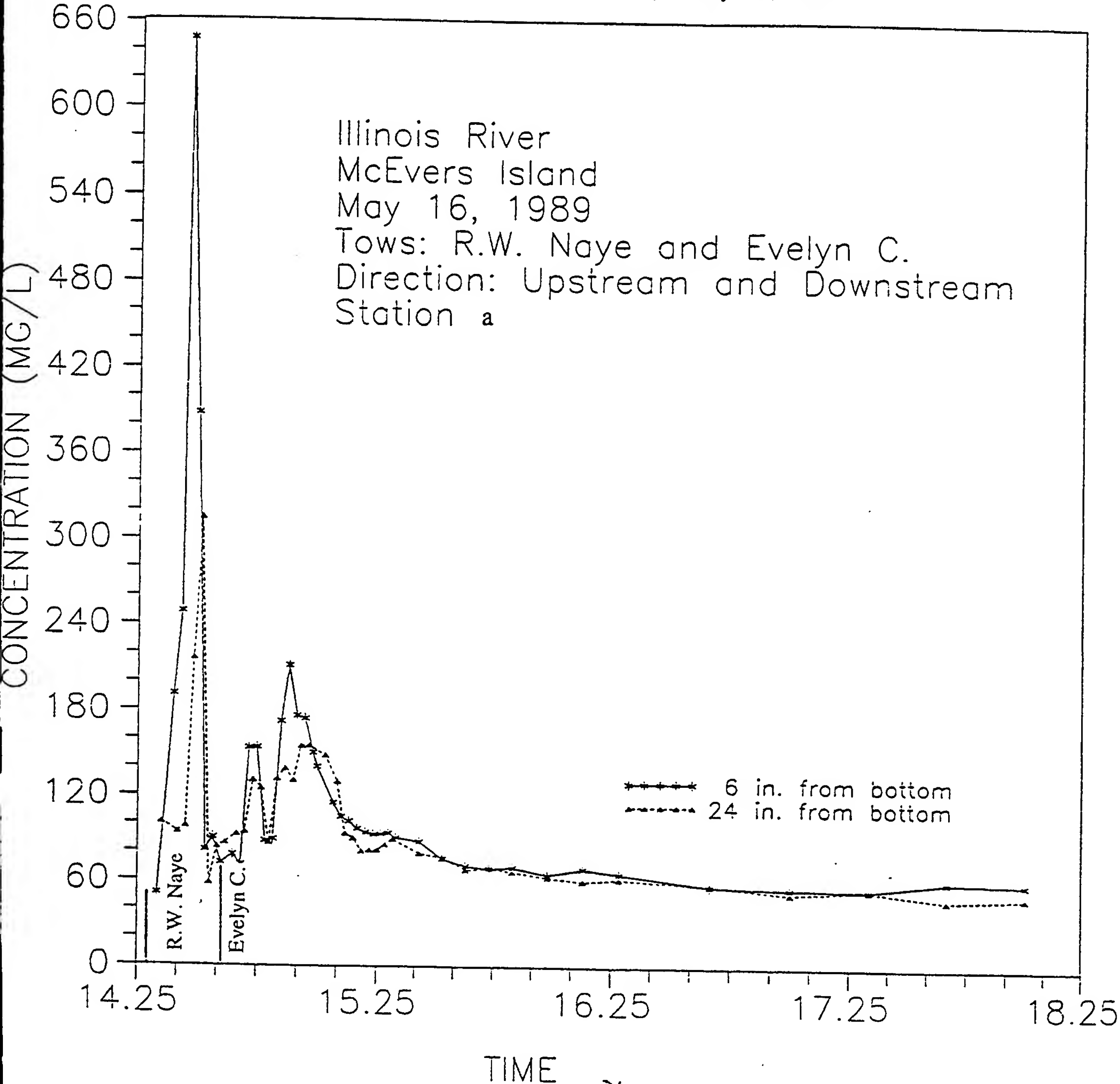
TYPICAL PLOTS OF SUSPENDED SEDIMENT CONCENTRATION VERSUS TIME

XXV-1. Variation of suspended sediment concentration with time, McEver's Island

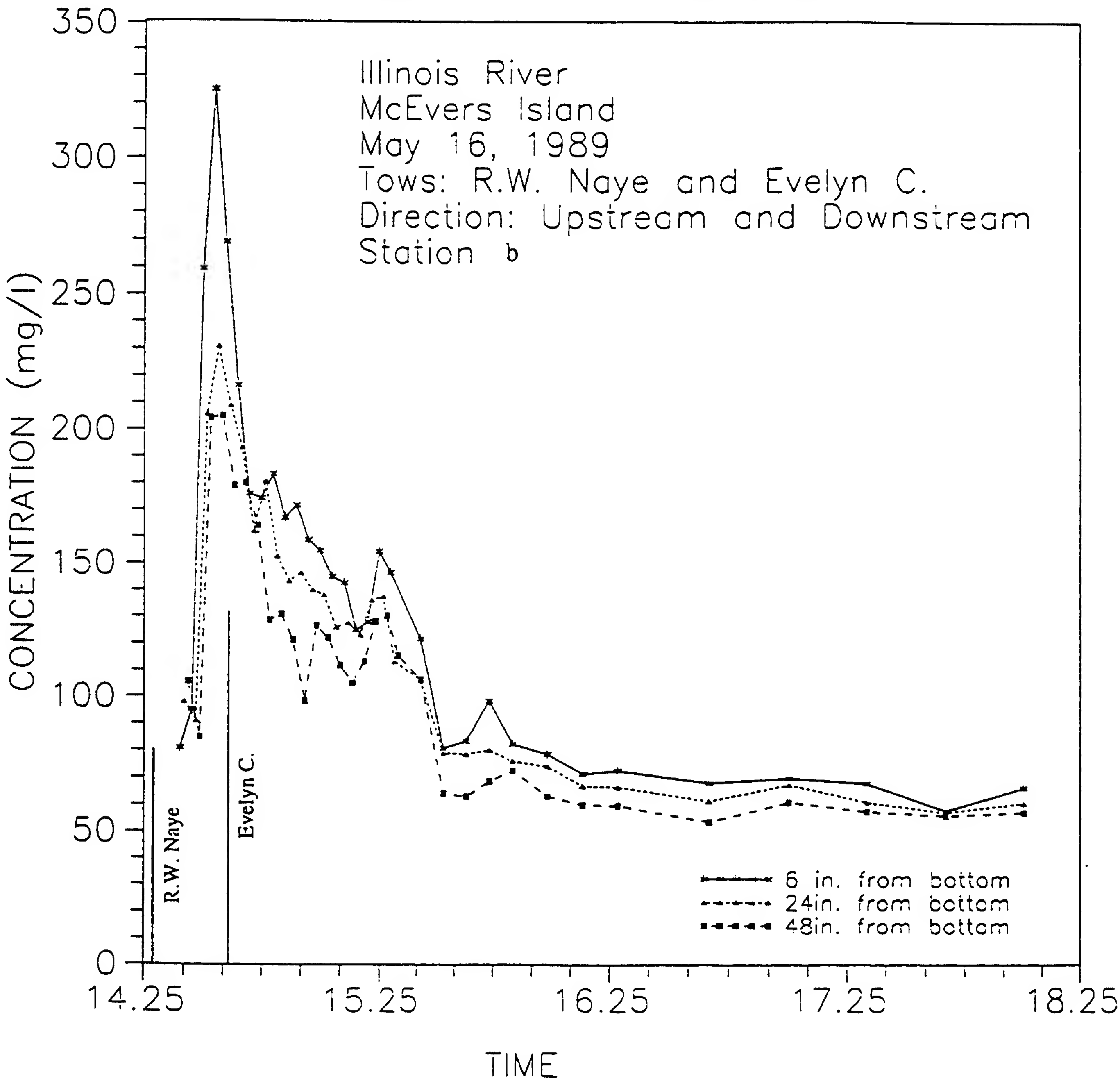
Location of suspended sediment sampling stations on the Illinois River near the McEver's Island site during May 15-19, 1989



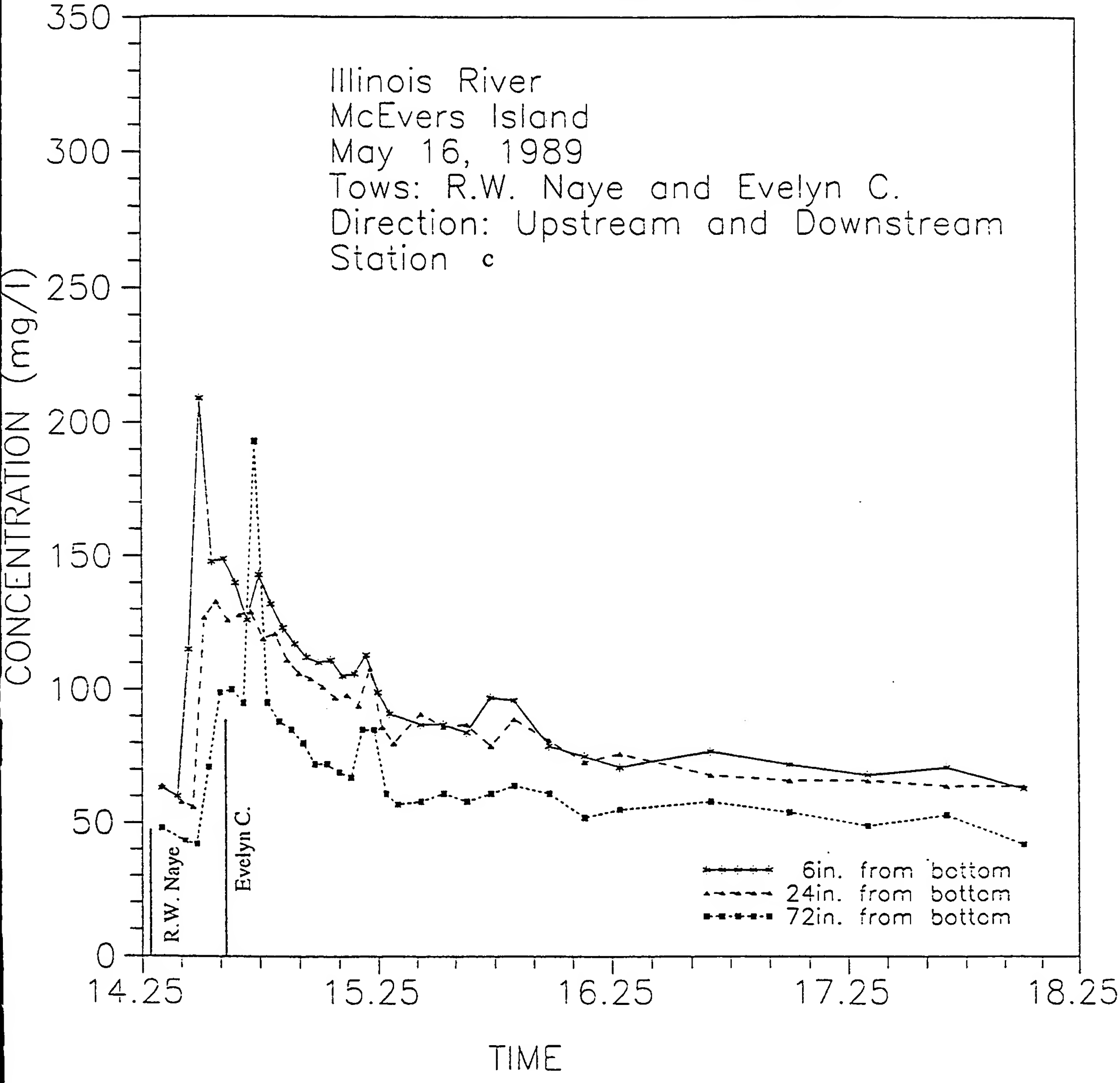
Station a (a1 and a2) May 16, 1989



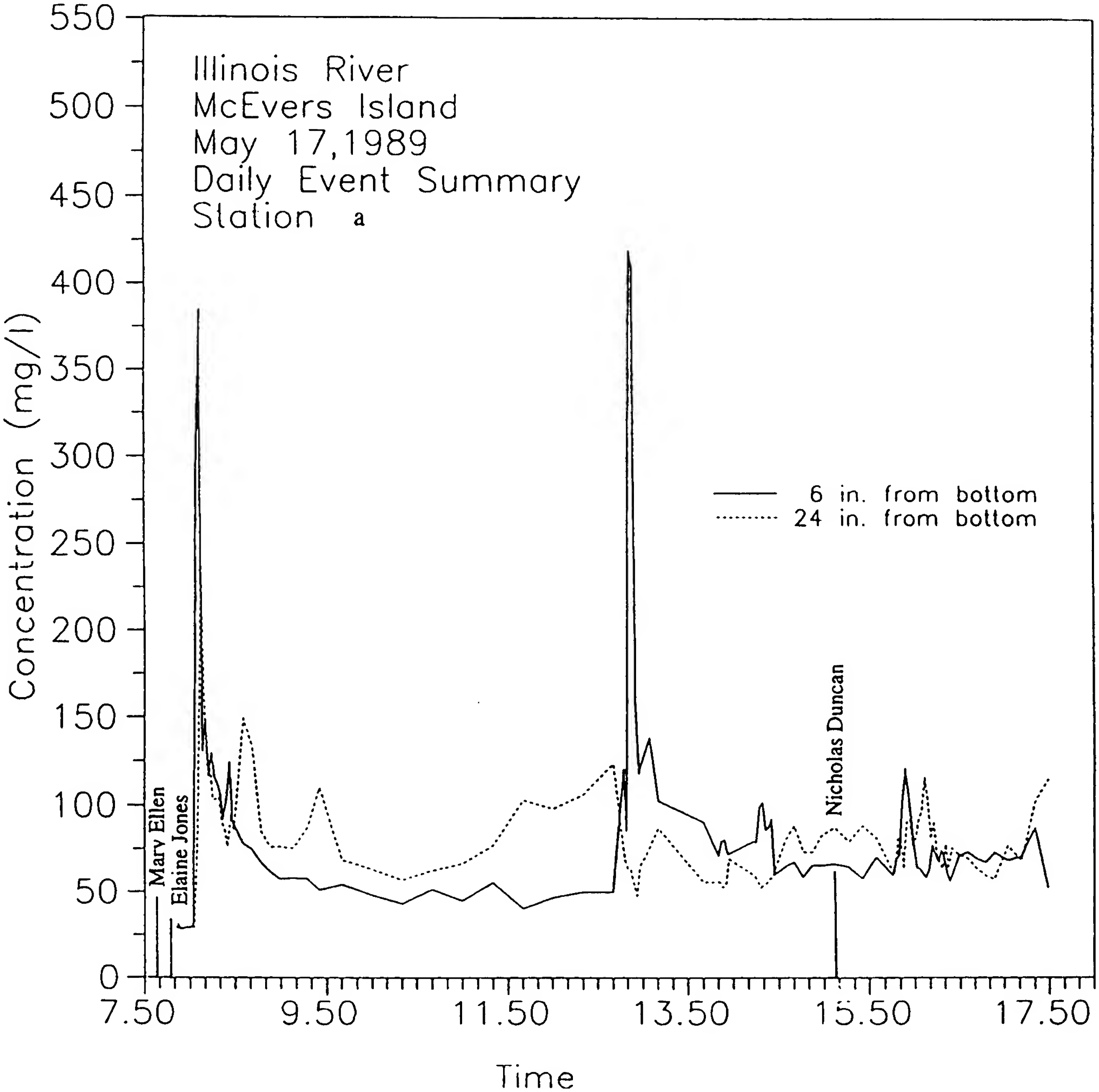
Station b (b1, b2, and b3) May 16,1989



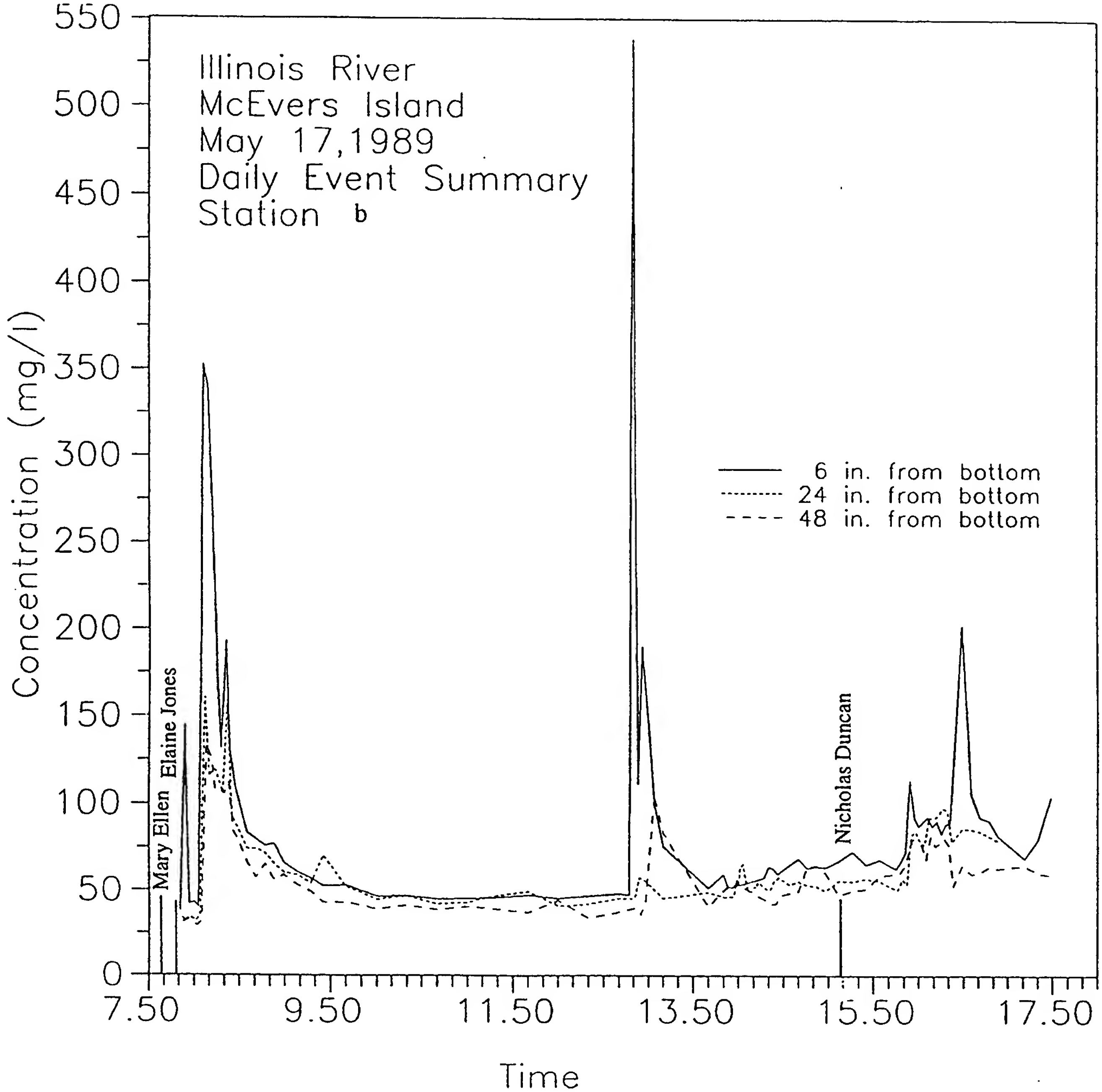
Station c (c1, c2, and c3) May 16, 1989



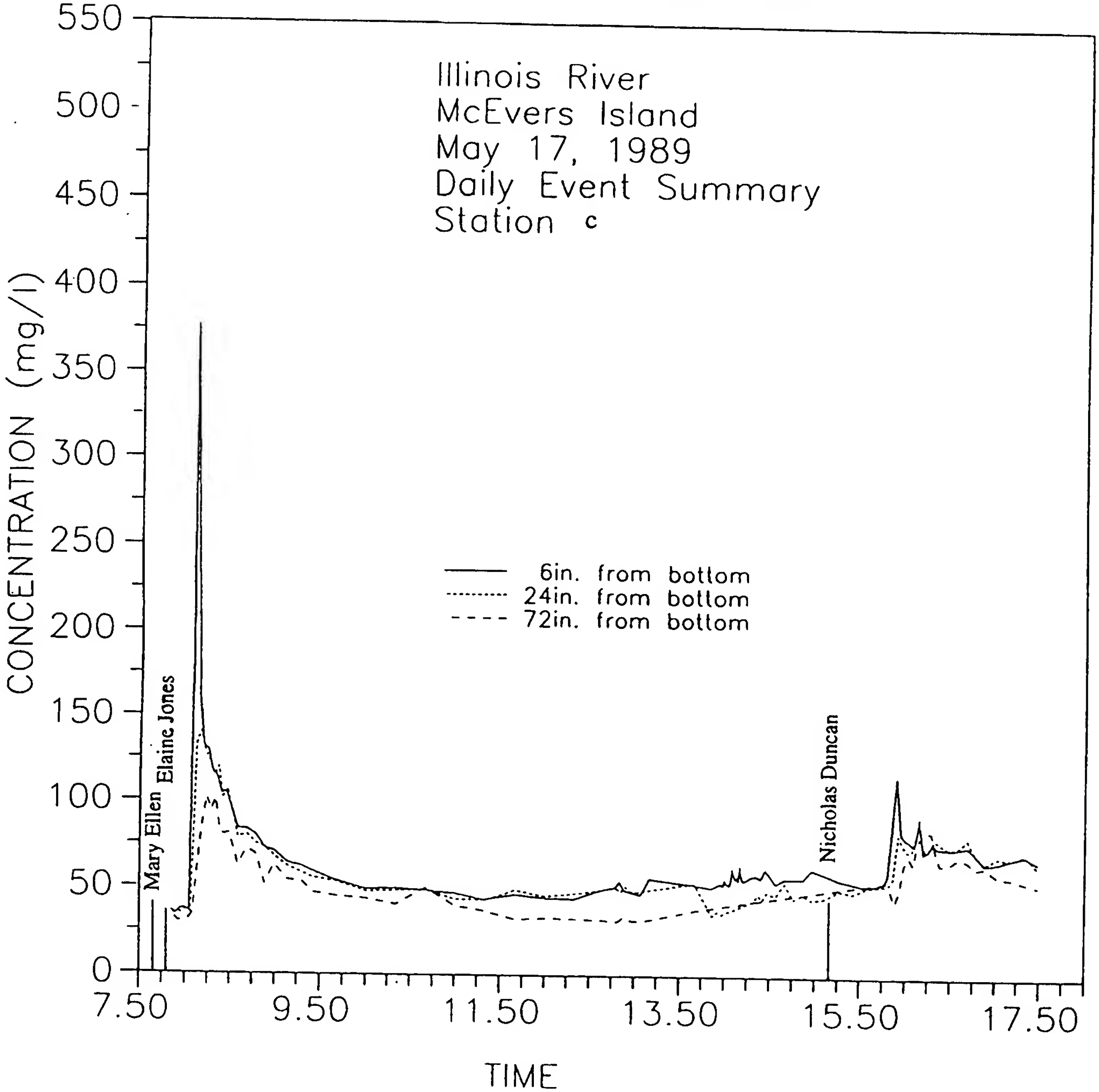
Station a (a1 and a2) May 17, 1989



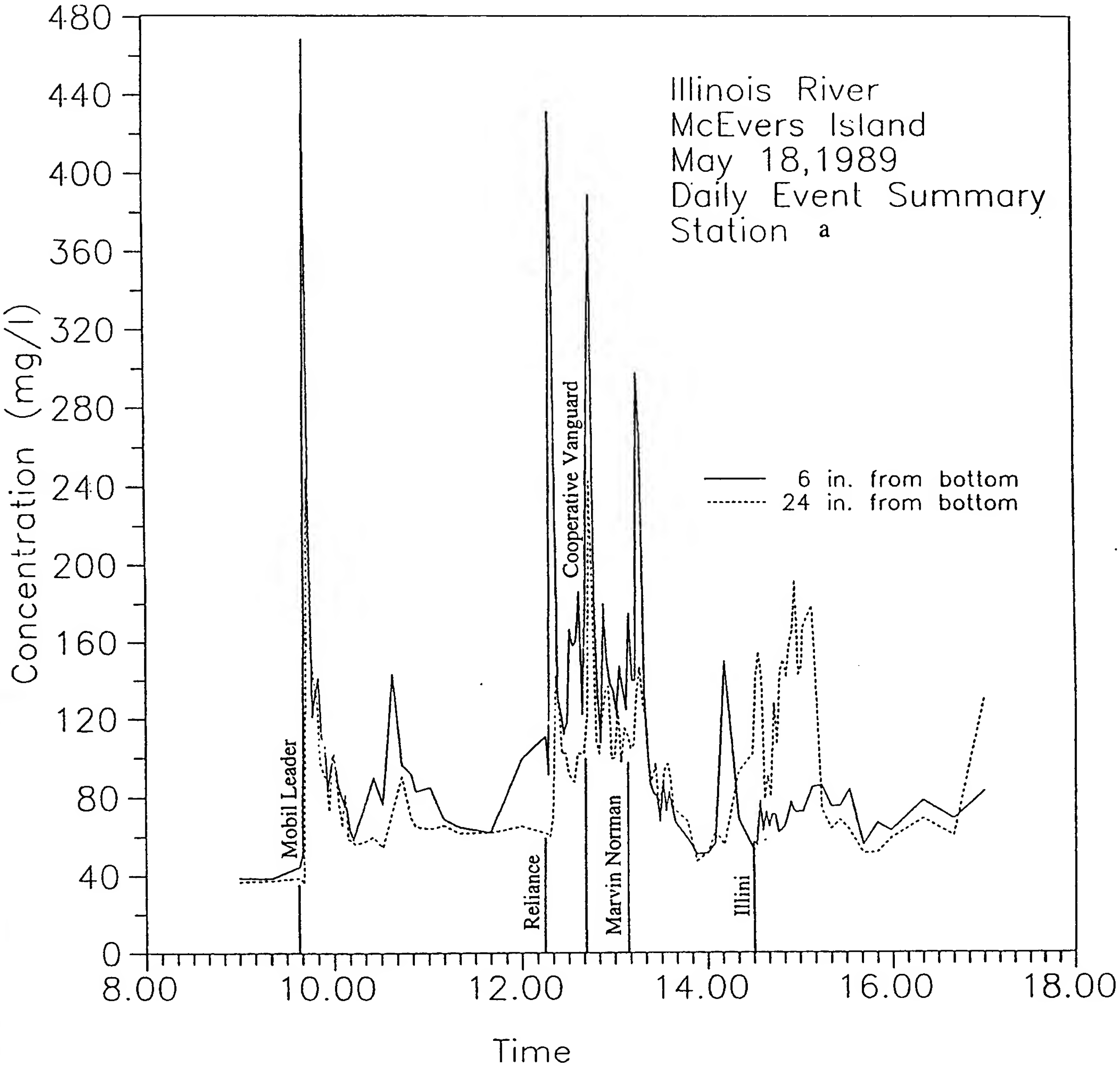
Station b (b1, b2, and b3) May 17,1989

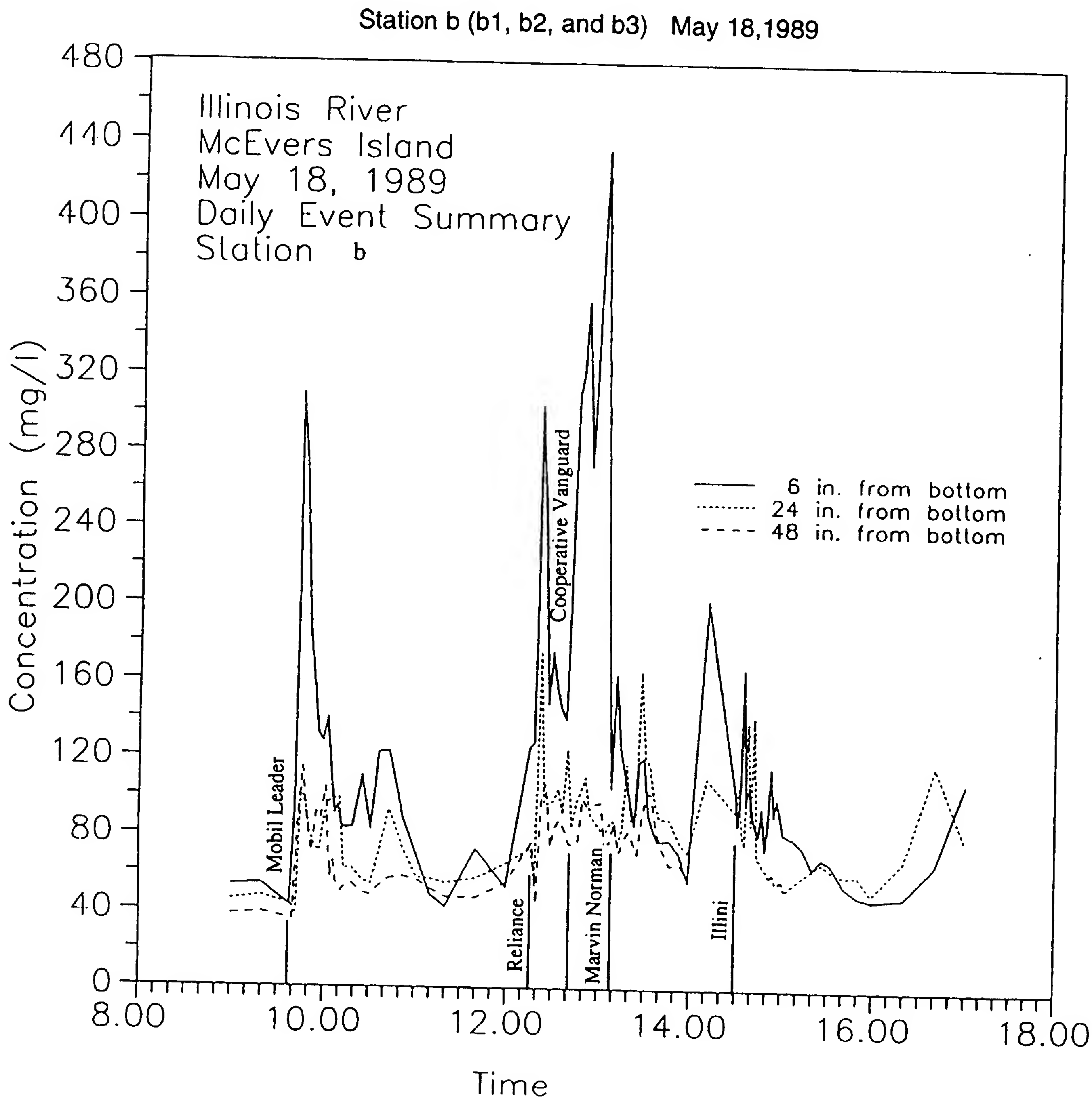


Station c (c1, c2, and c3) May 17, 1989



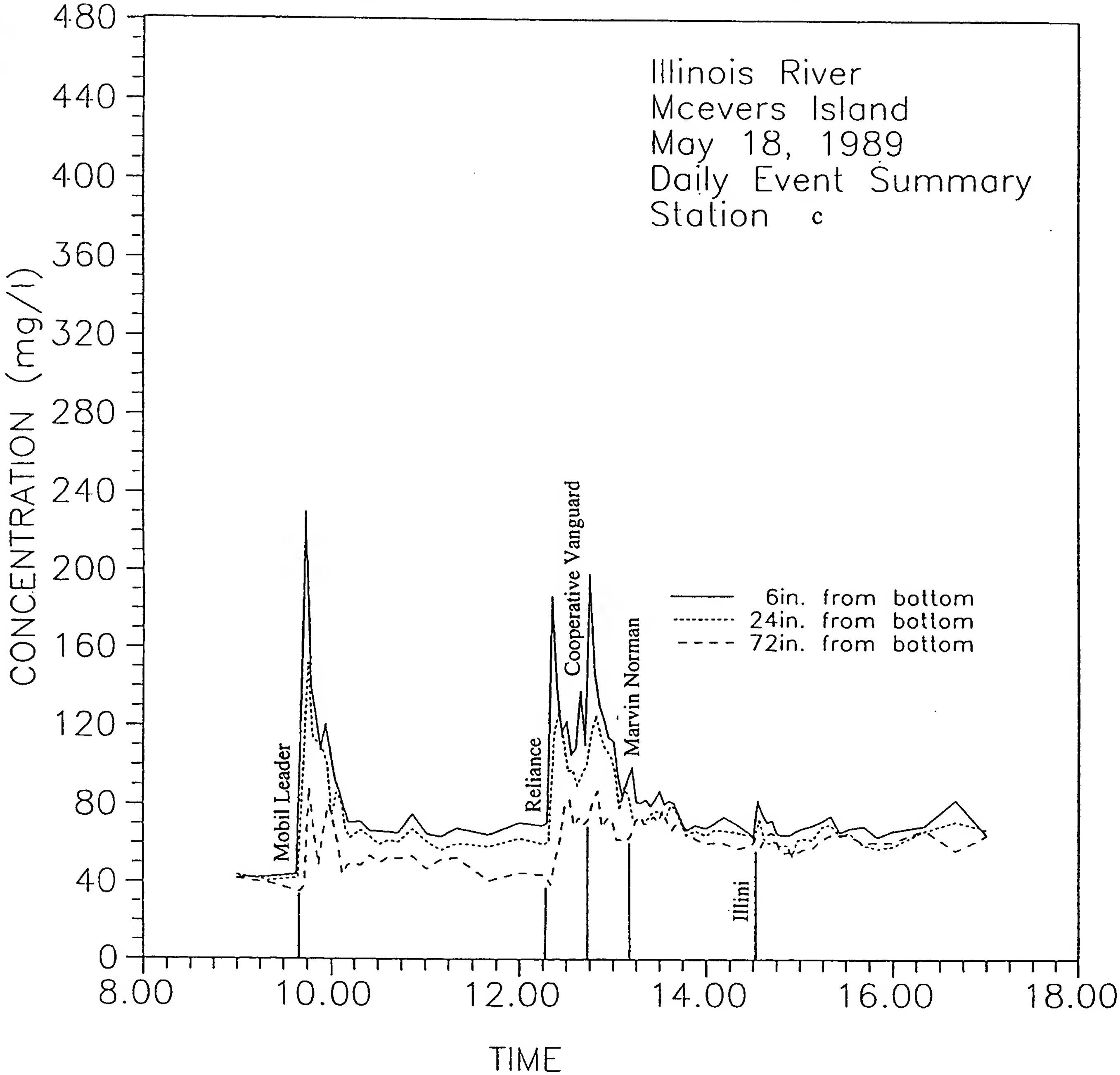
Station a (a1 and a2) May 18, 1989





Station b (b1, b2, and b3) May 18,1989
Illinois River
McEvers Island
May 18, 1989
Daily Event Summary
Station b
Concentration (mg/l)
Time
6 in. from bottom
24 in. from bottom
48 in. from bottom
Mobil Leader
Reliance
Cooperative Vanguard
Marvin Norman
Illini
480
440
400
360
320
280
240
200
160
120
80
40
0
8.00
10.00
12.00
14.00
16.00
18.00

Station c (c1, c2, and c3) May 18, 1989



XXV-2. Variation of suspended sediment concentration with time, Apple River Island

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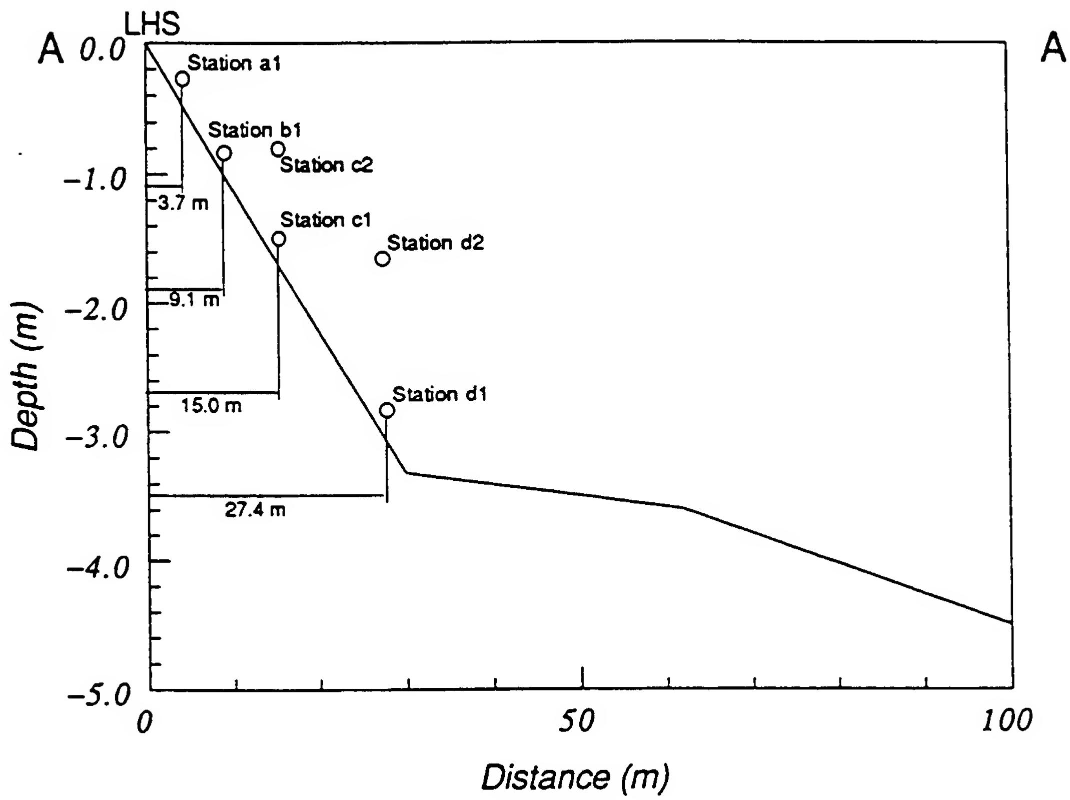
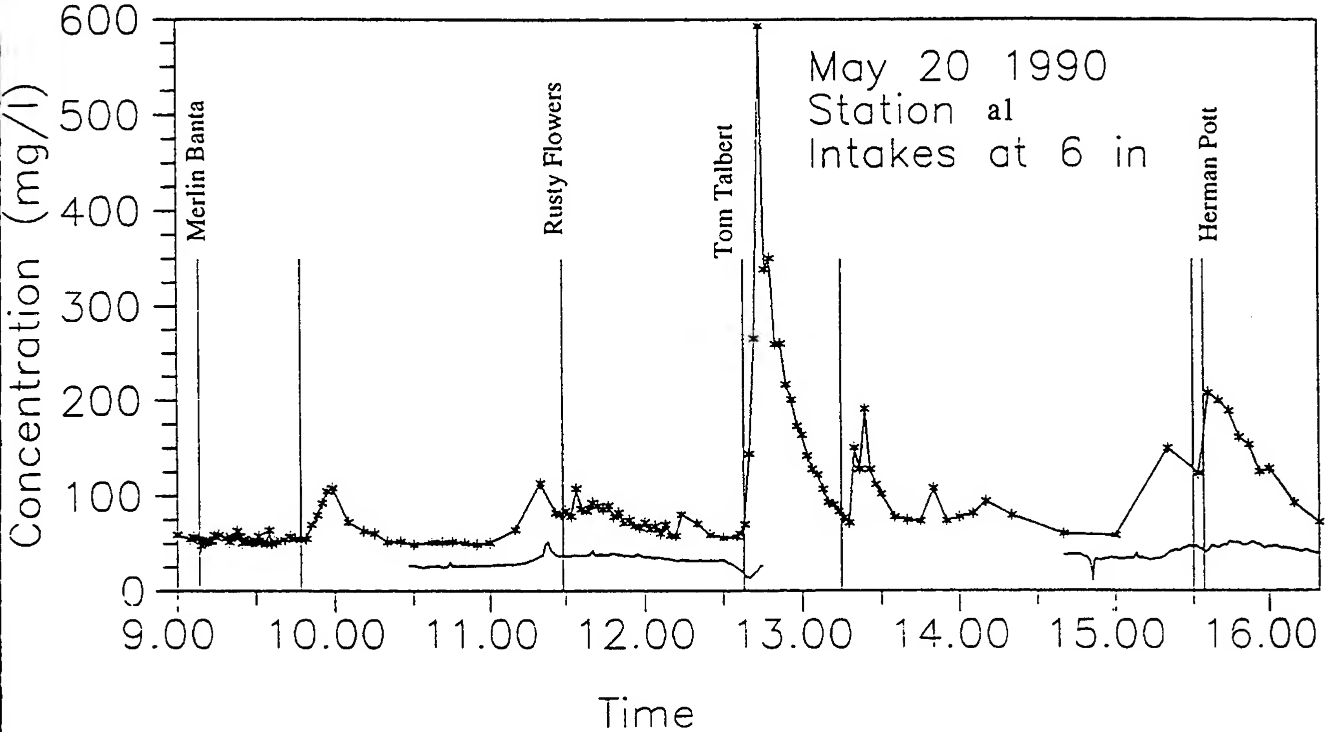
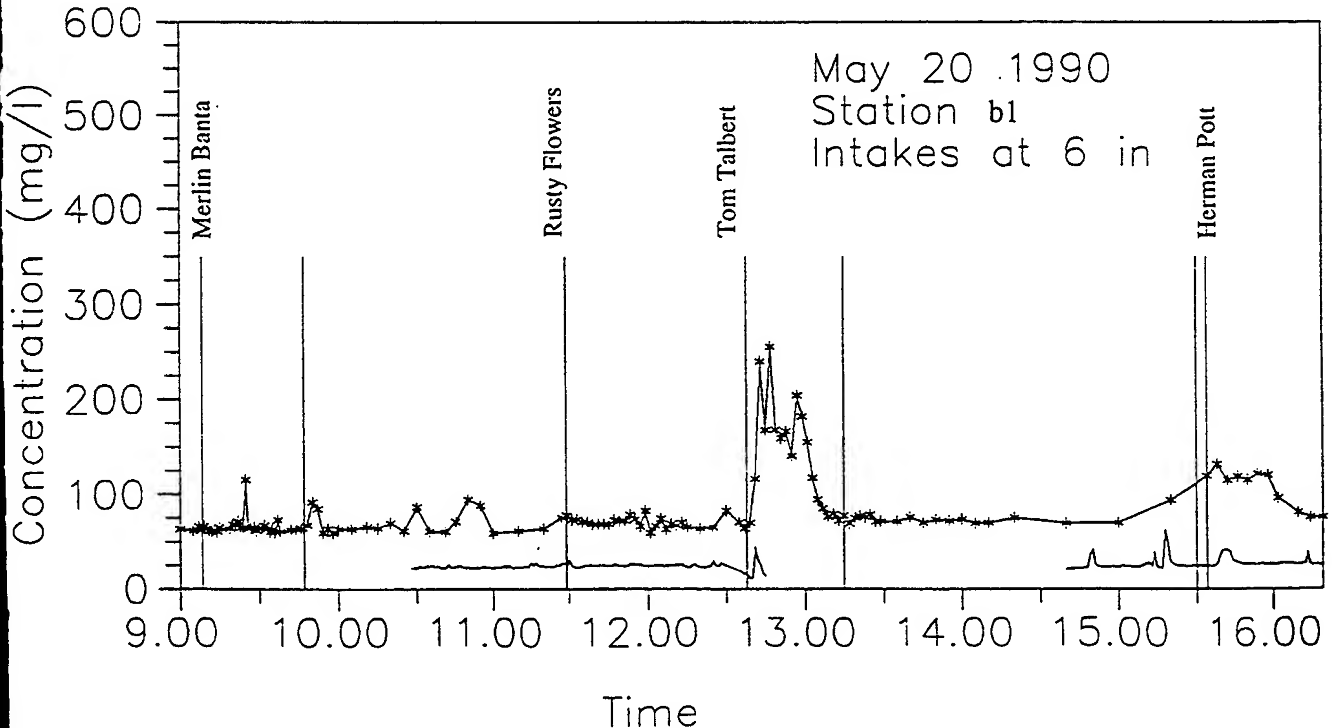
Location of suspended sediment sampling stations on the Mississippi River near the Apple River Island site during May 14-25, 1990

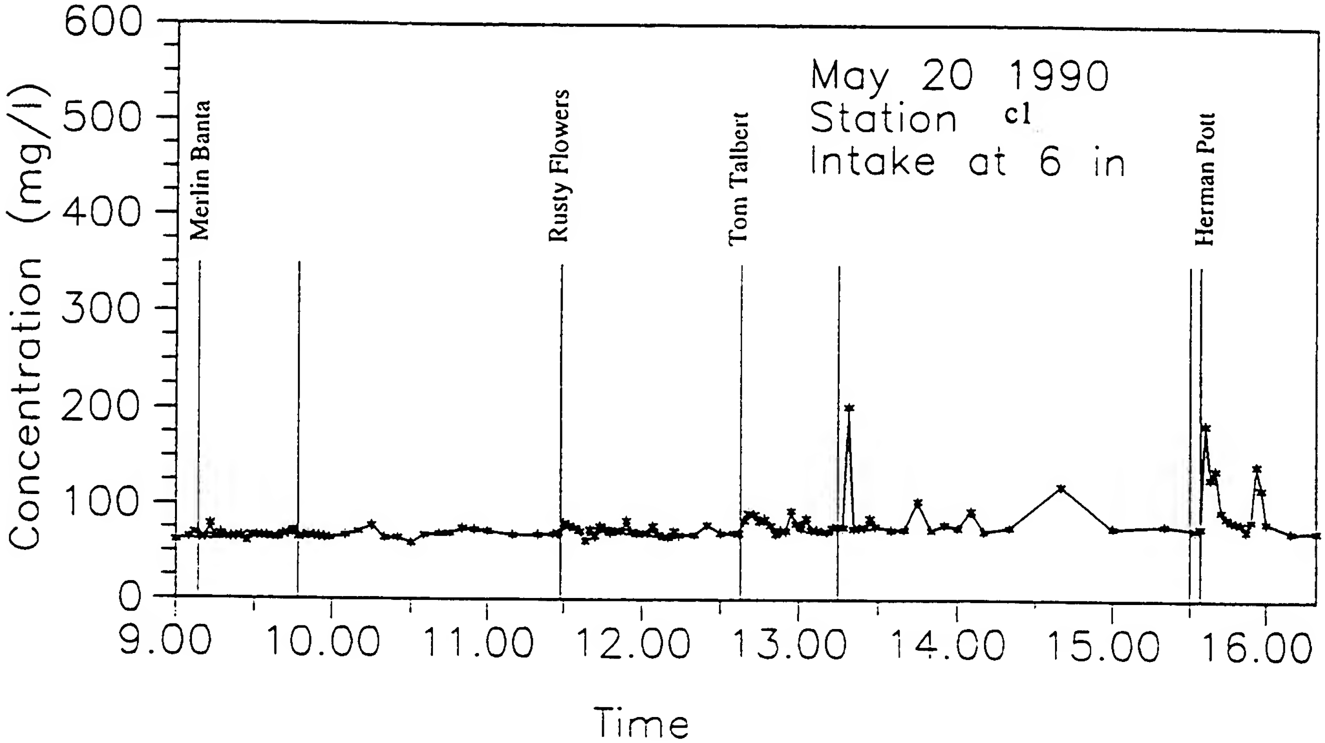


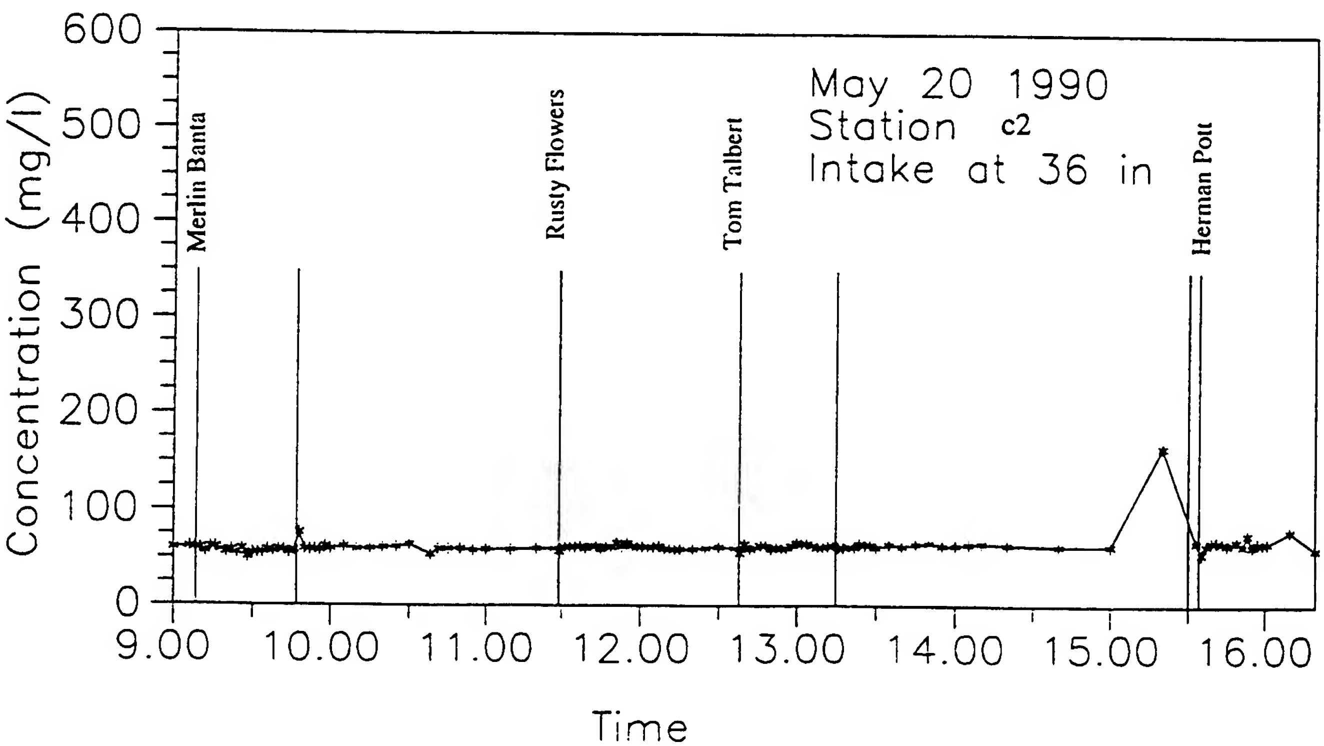
Stations a1 and b1 May 20, 1990



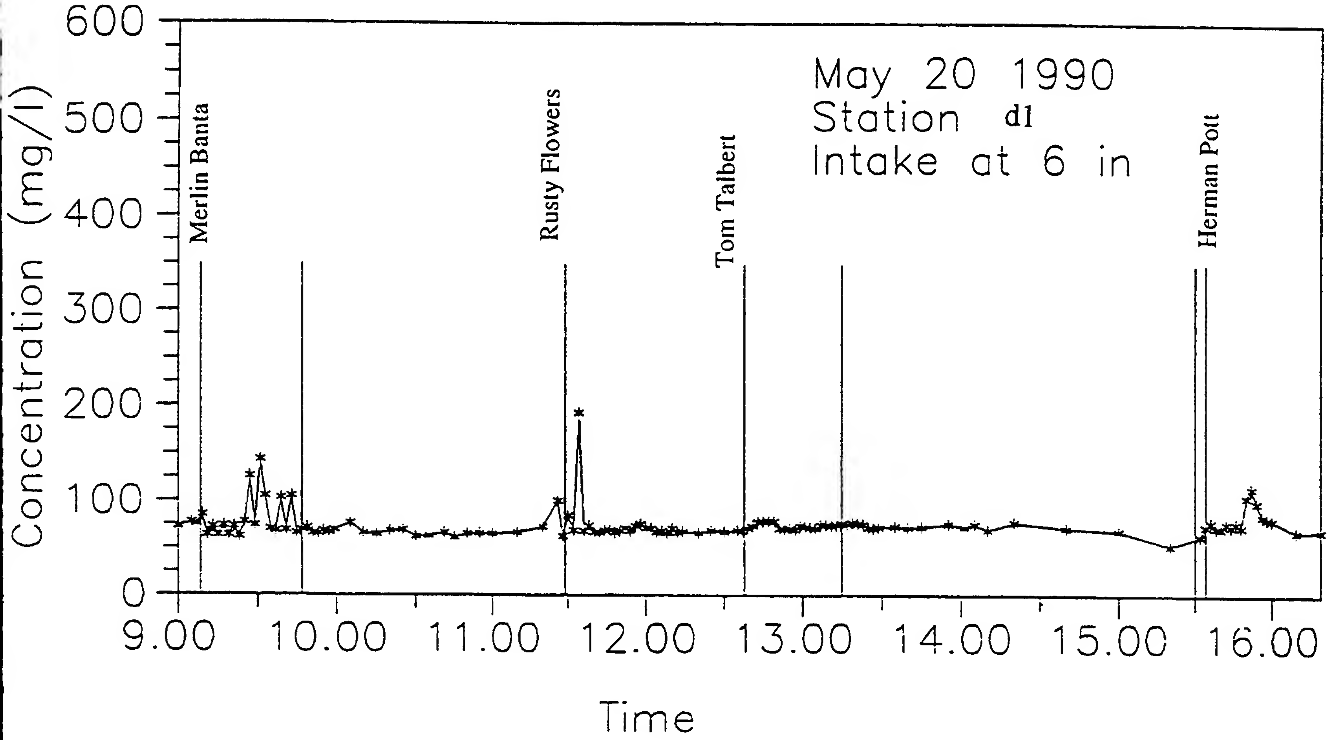


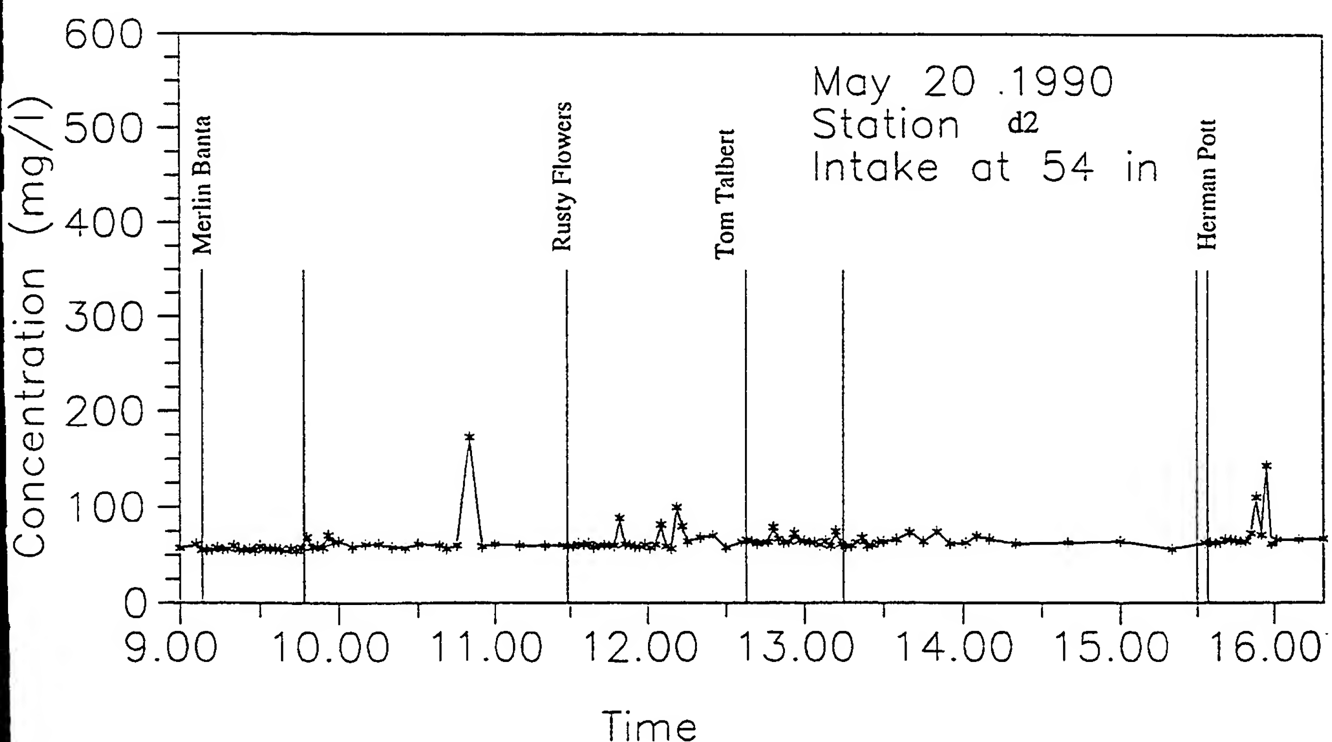
Stations c1 and c2 May 20, 1990



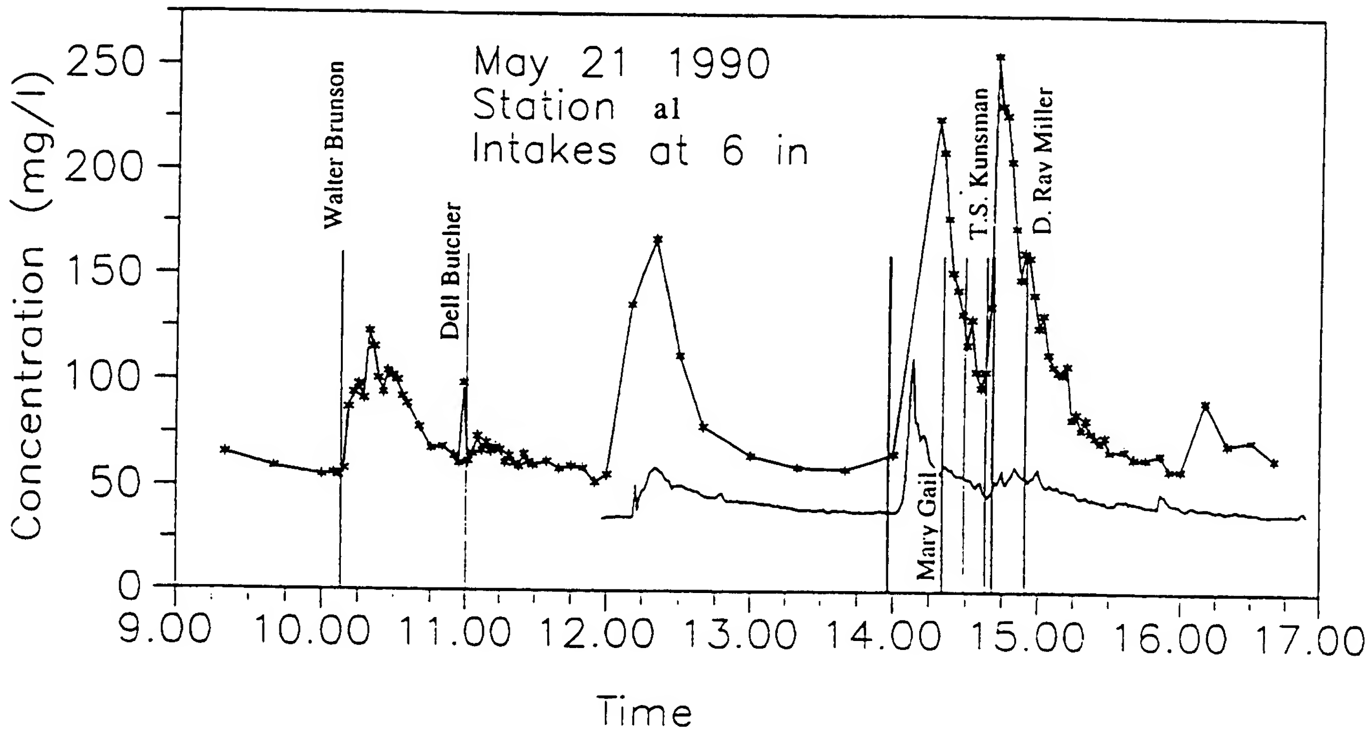


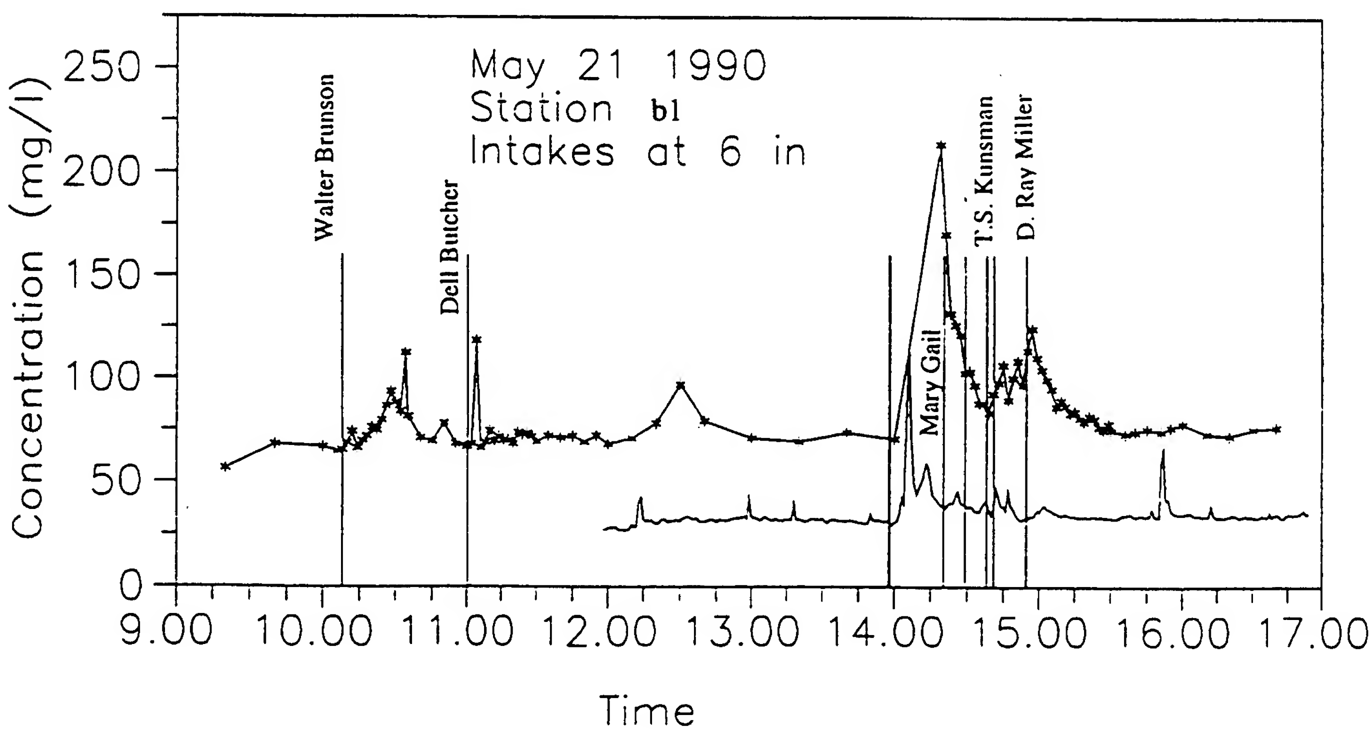
Stations d1 and d2 May 20, 1990



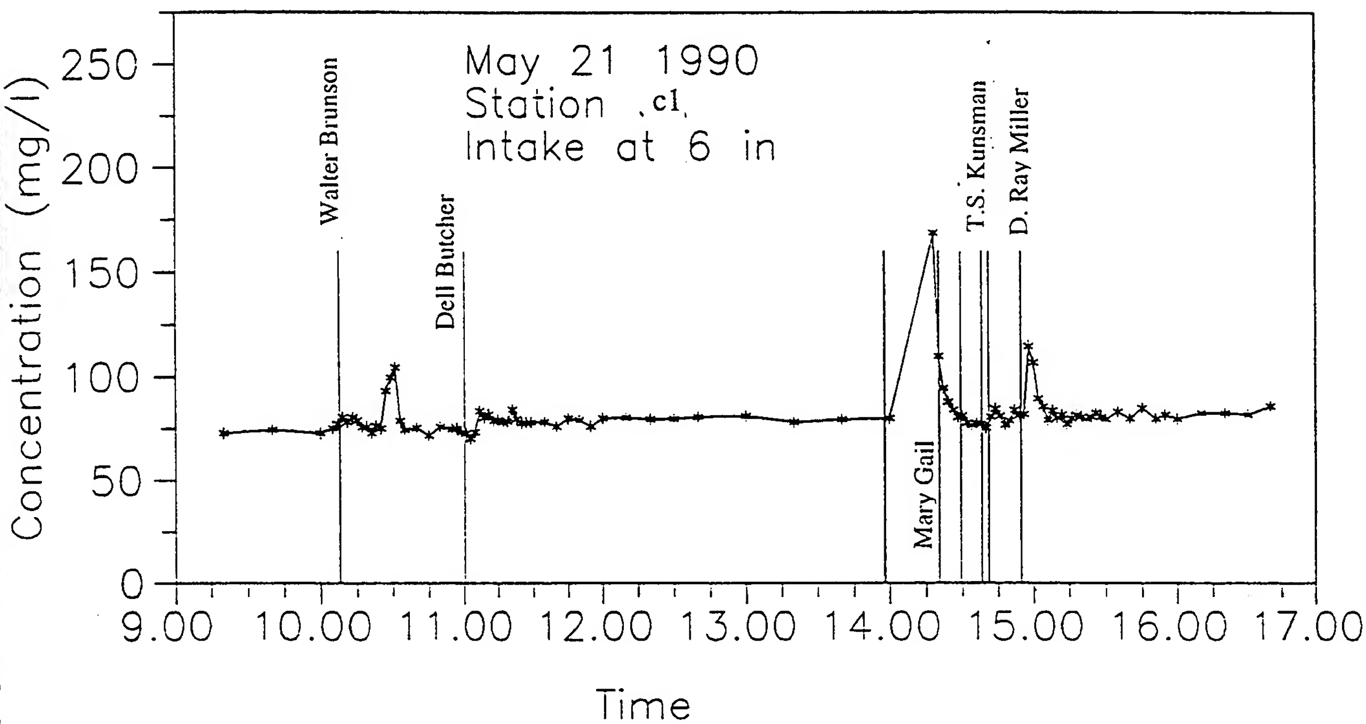


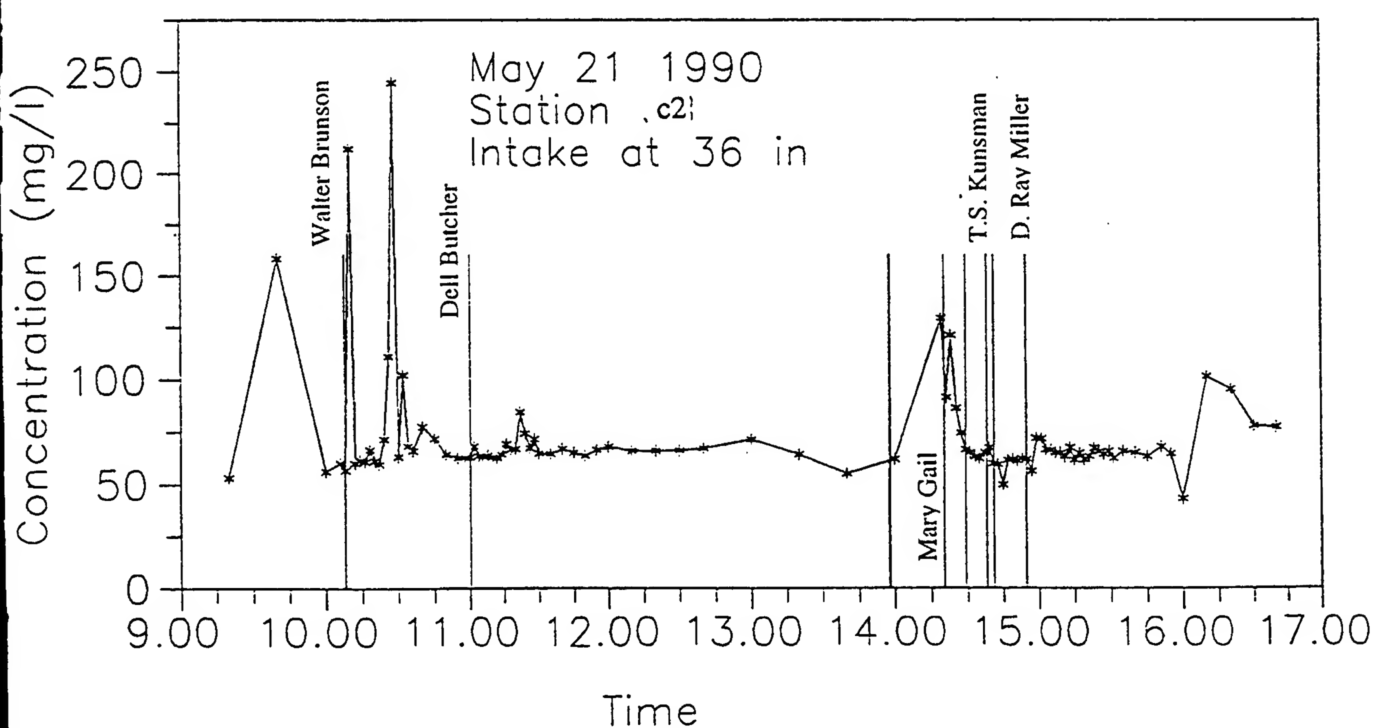
Stations a1 and b1   May 21, 1990



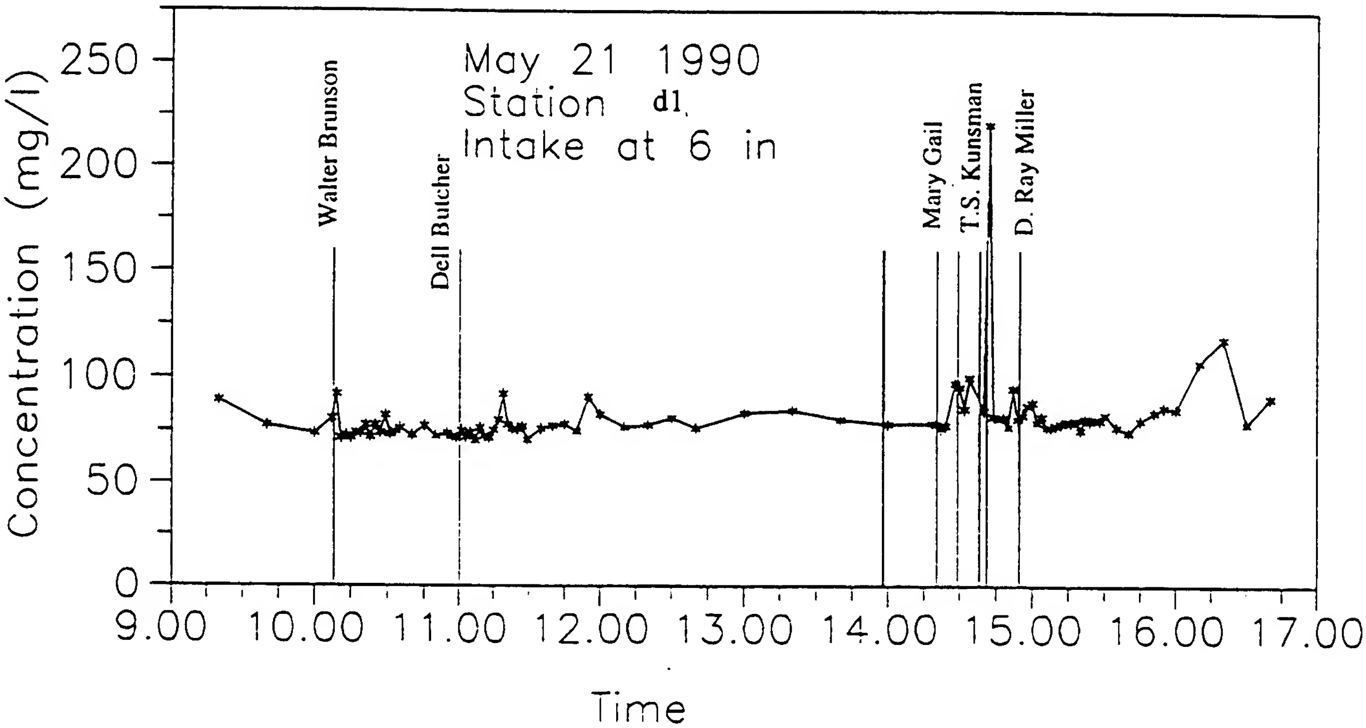


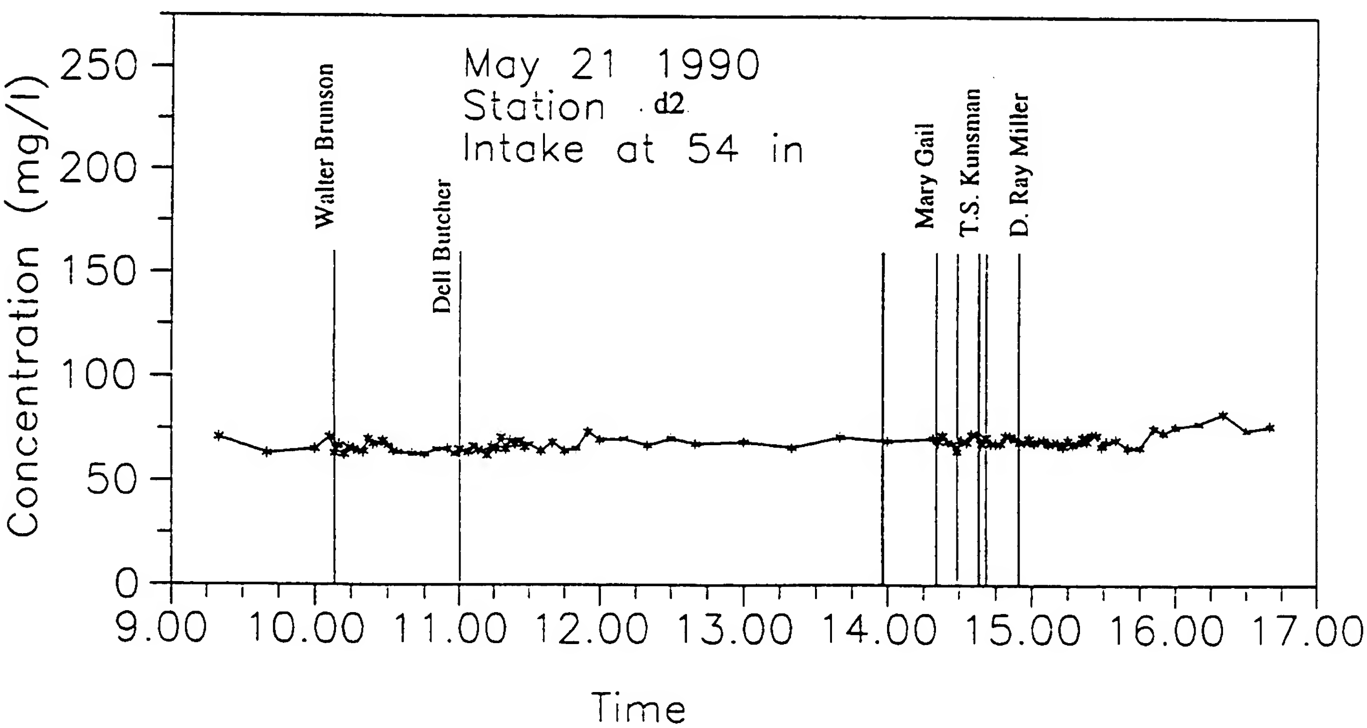
Stations c1 and c2 May 21, 1990



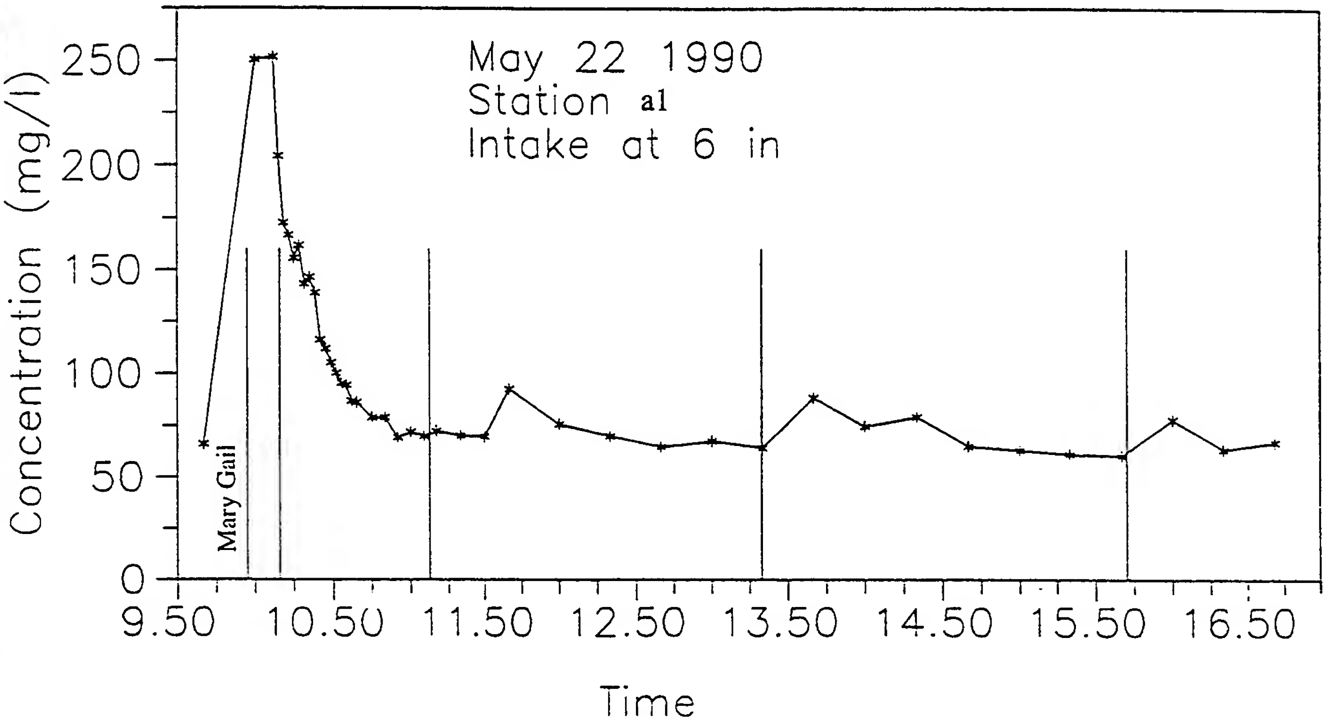


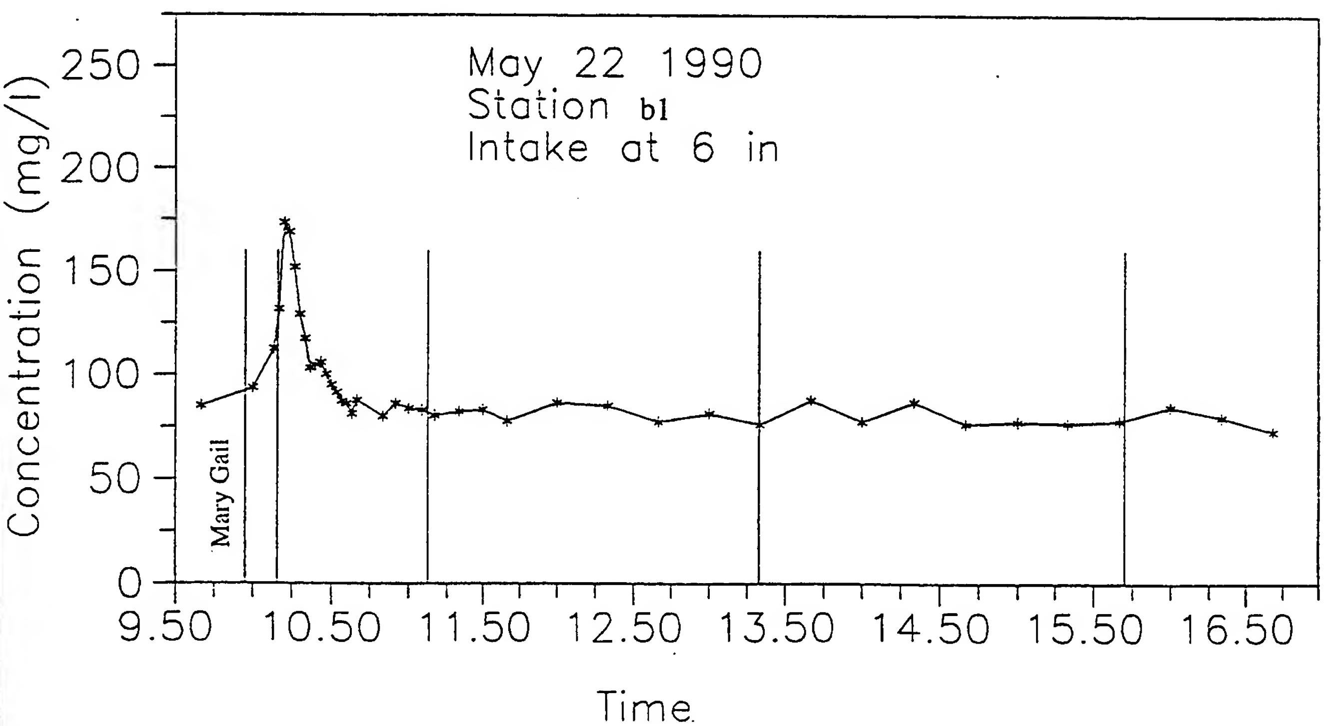
Stations d1 and d2 May 21, 1990



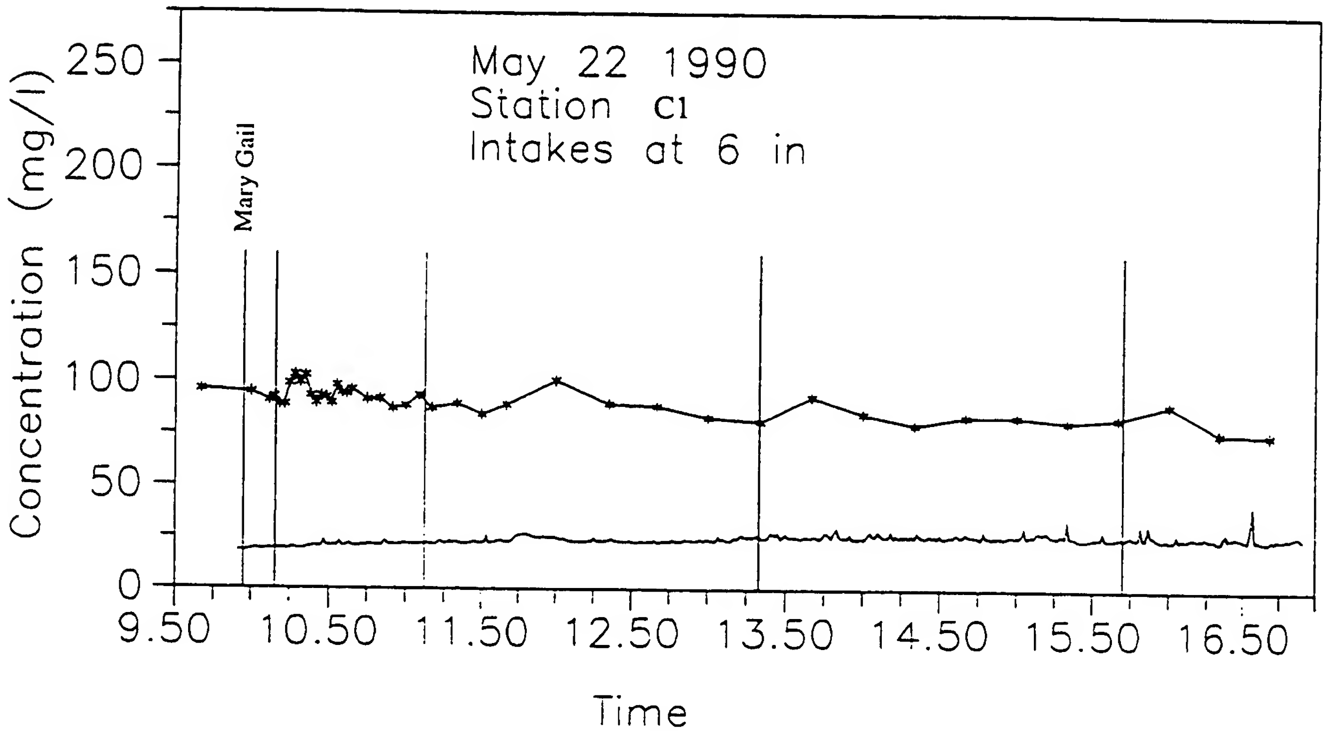


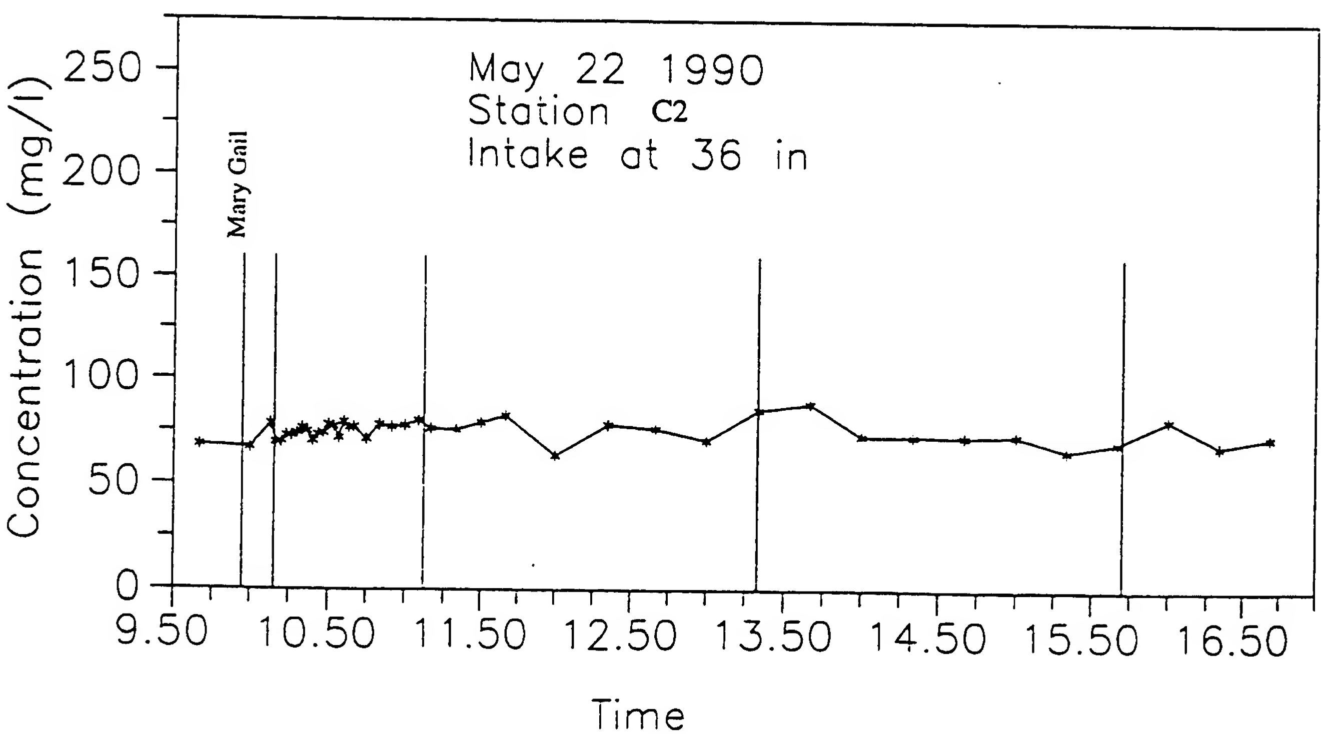
Stations a1 and b1   May 22, 1990



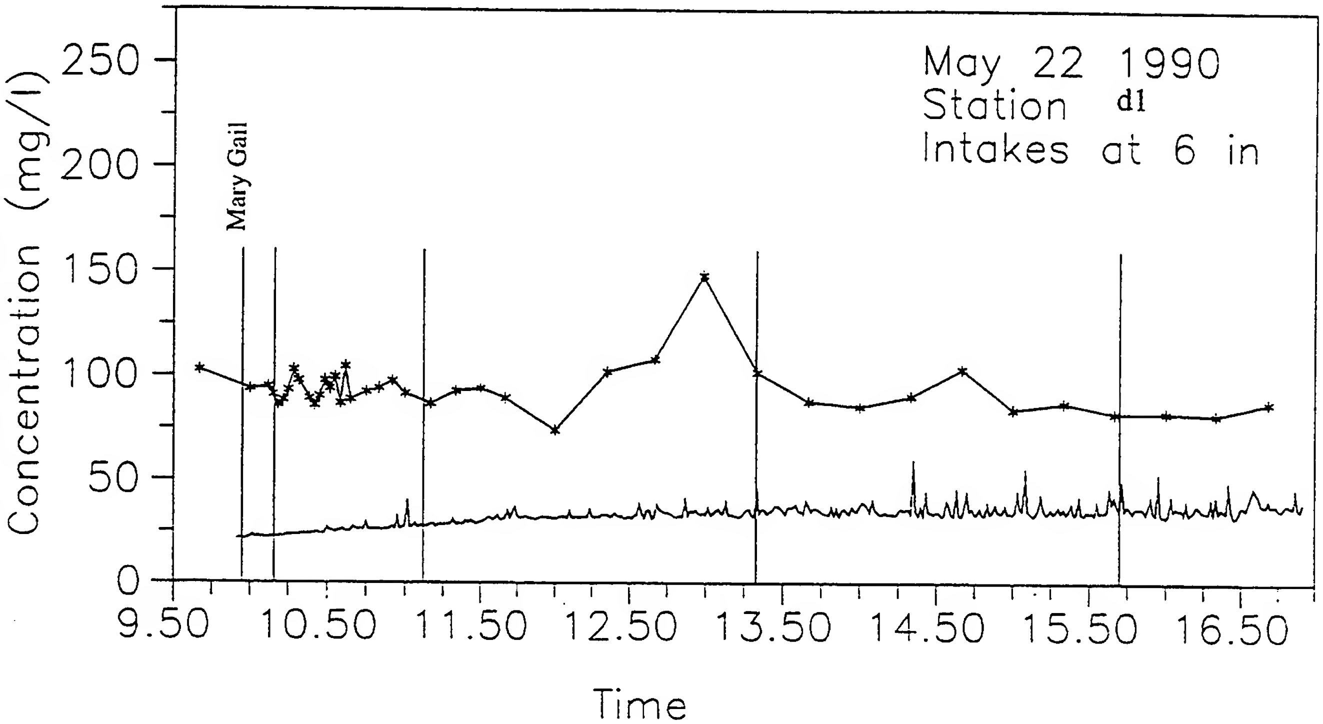


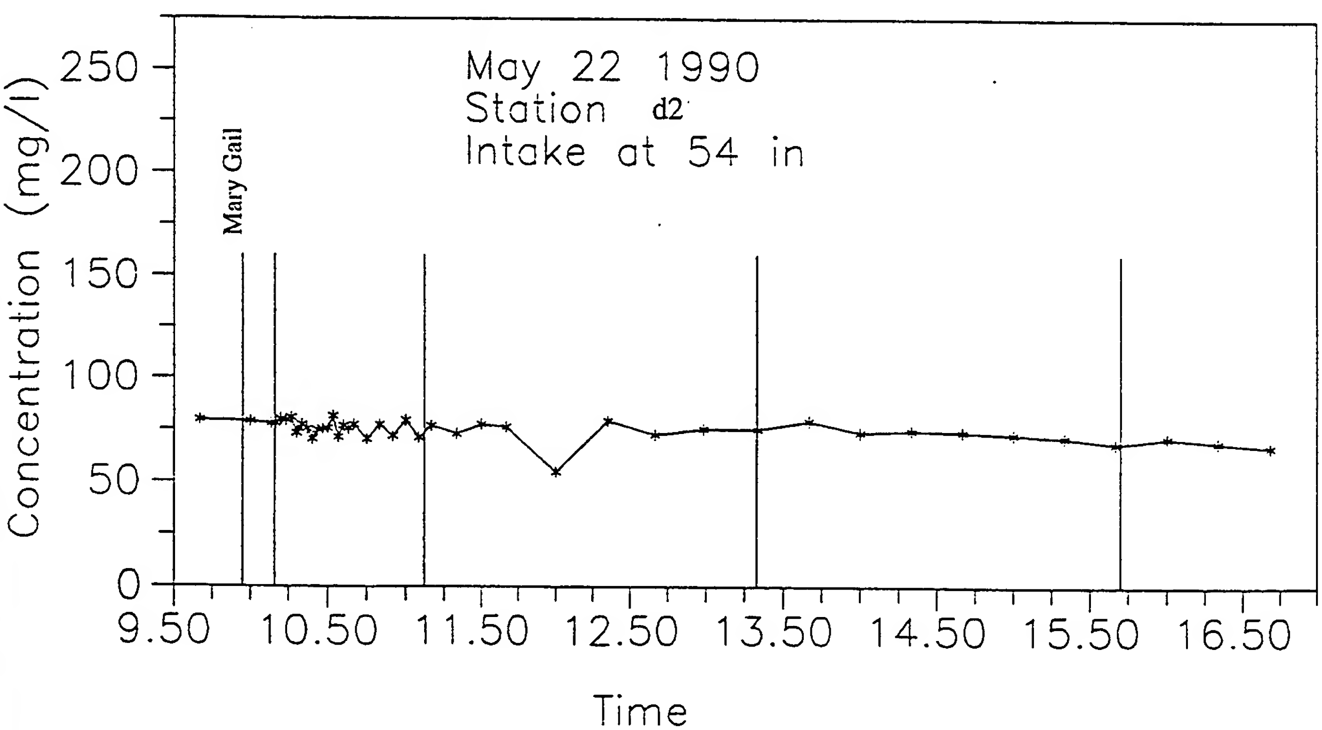
Stations c1 and c2 May 22, 1990



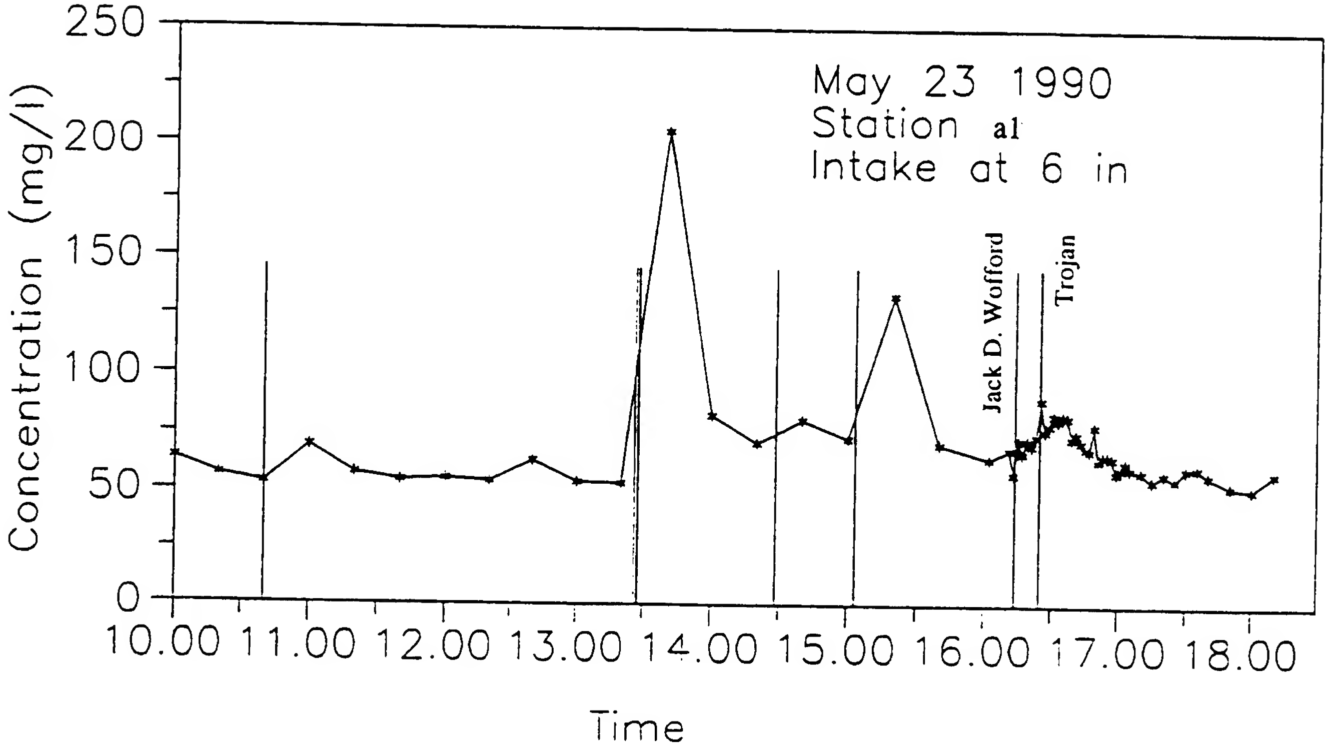


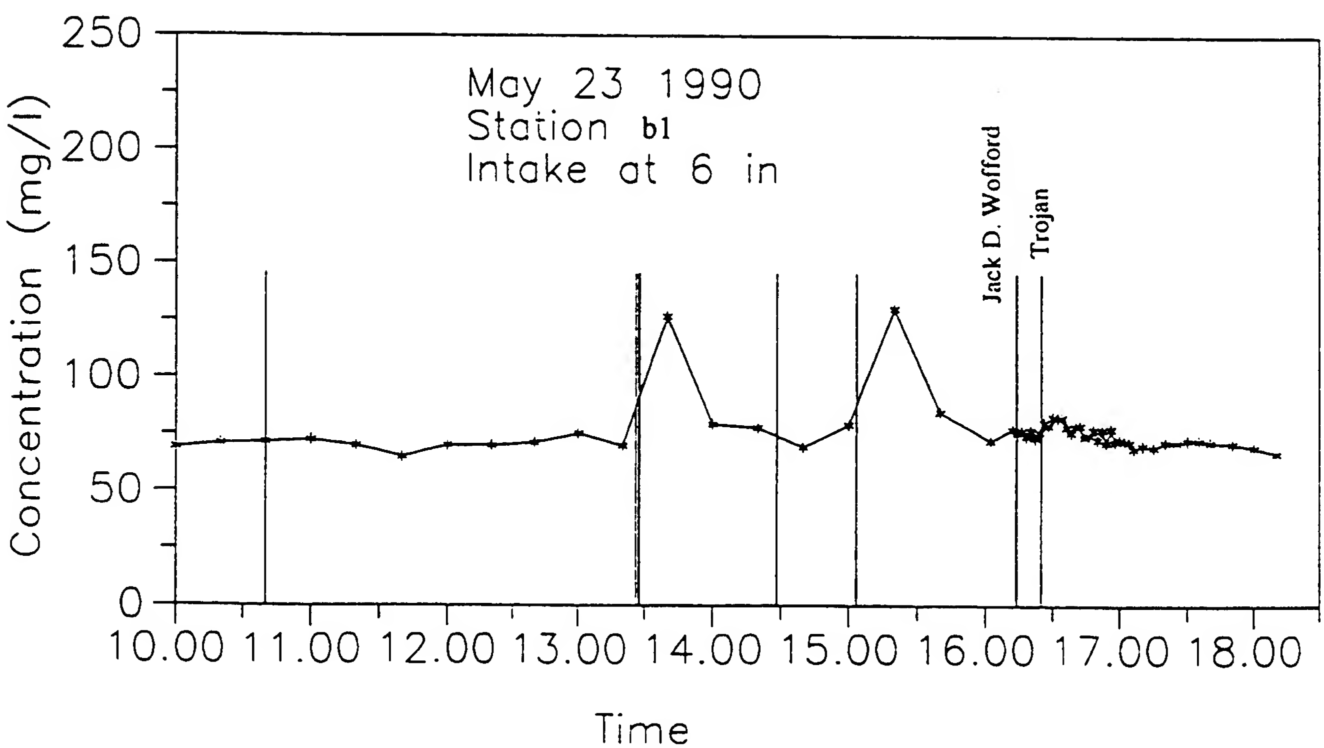
Stations d1 and d2   May 22, 1990



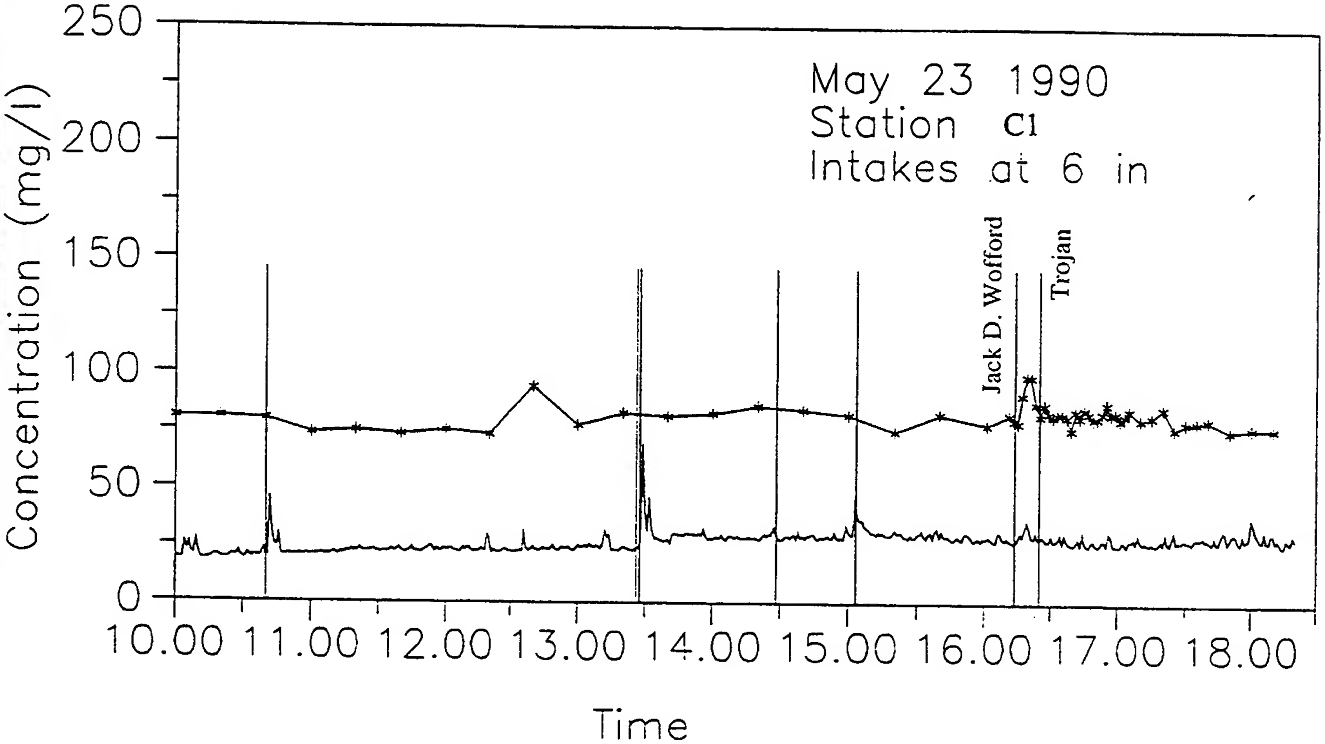


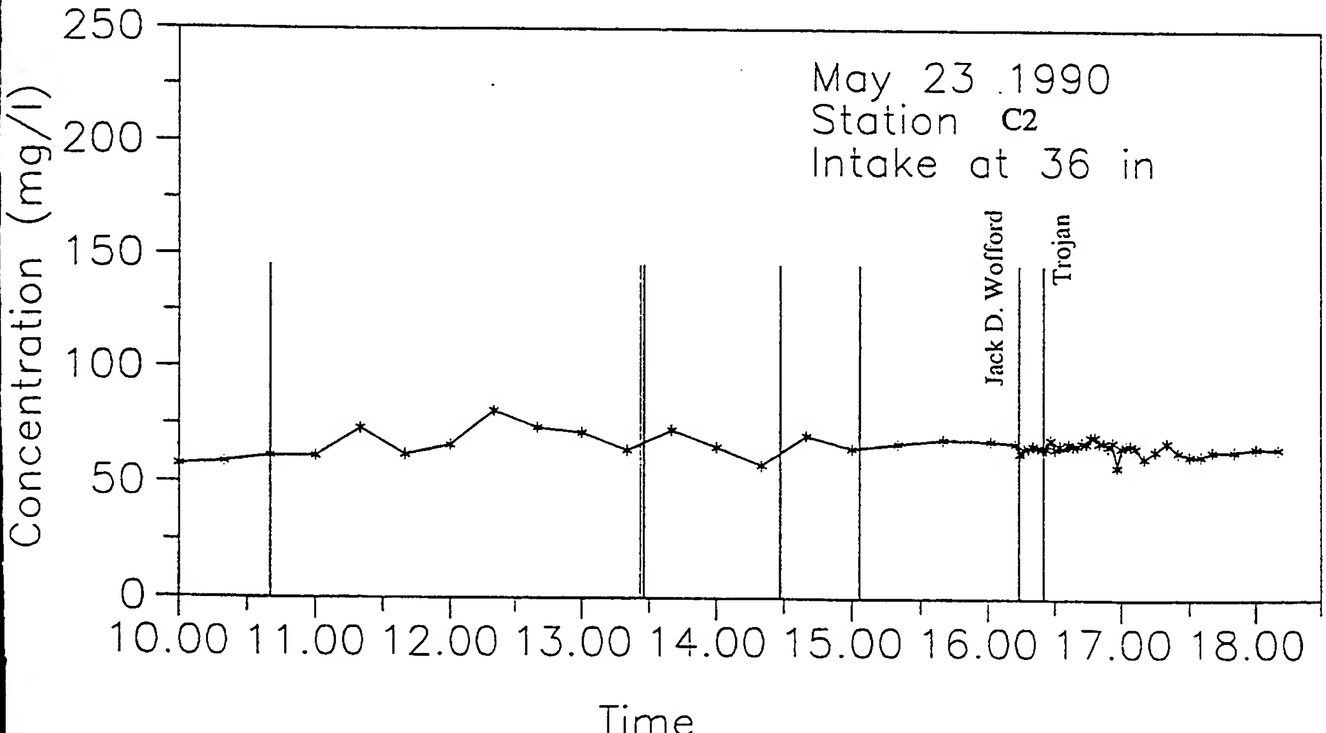
Stations a1 and b1   May 23, 1990



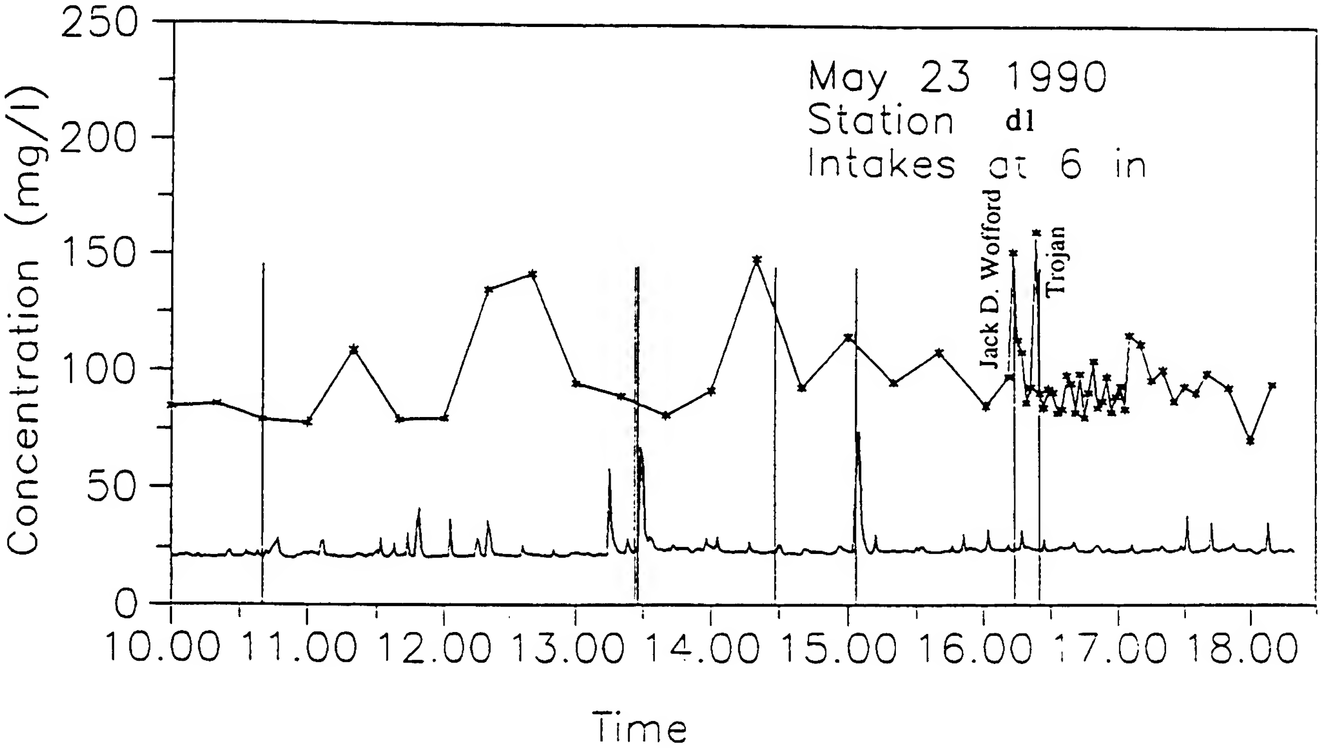


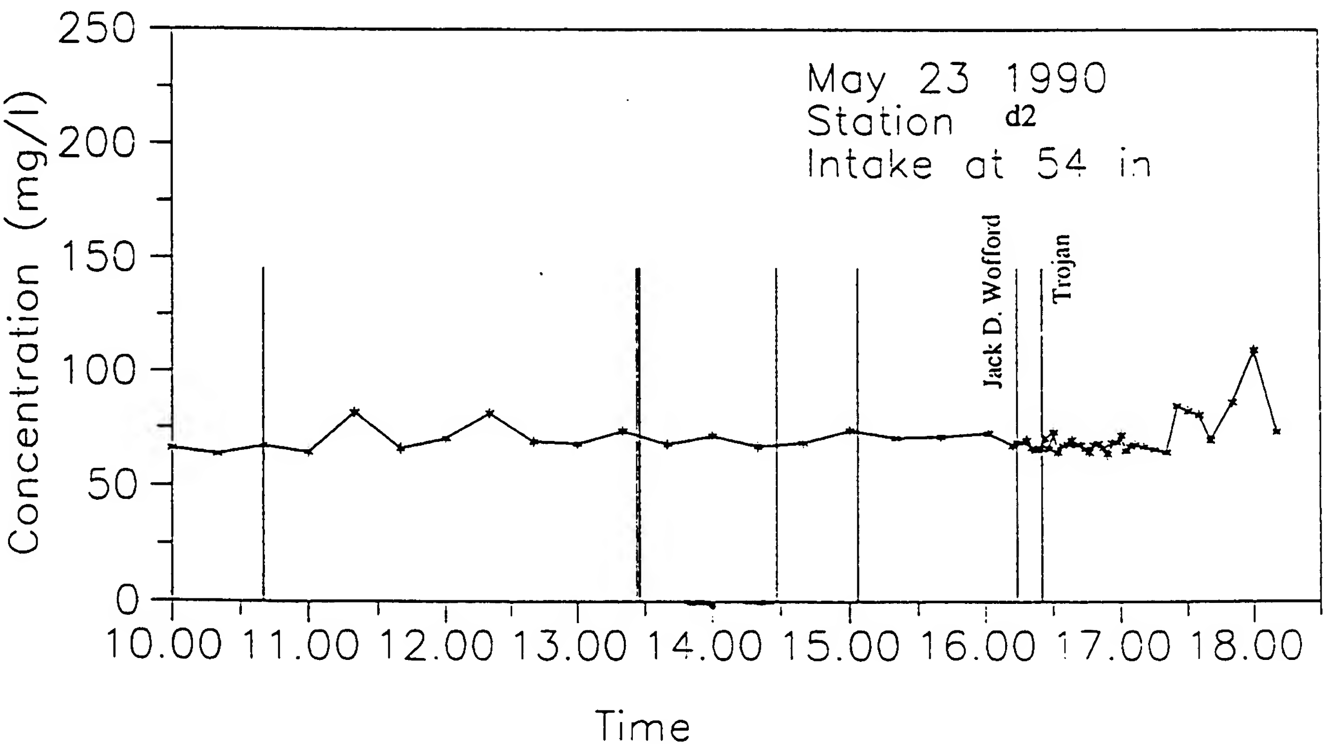
Stations c1 and c2 May 23, 1990





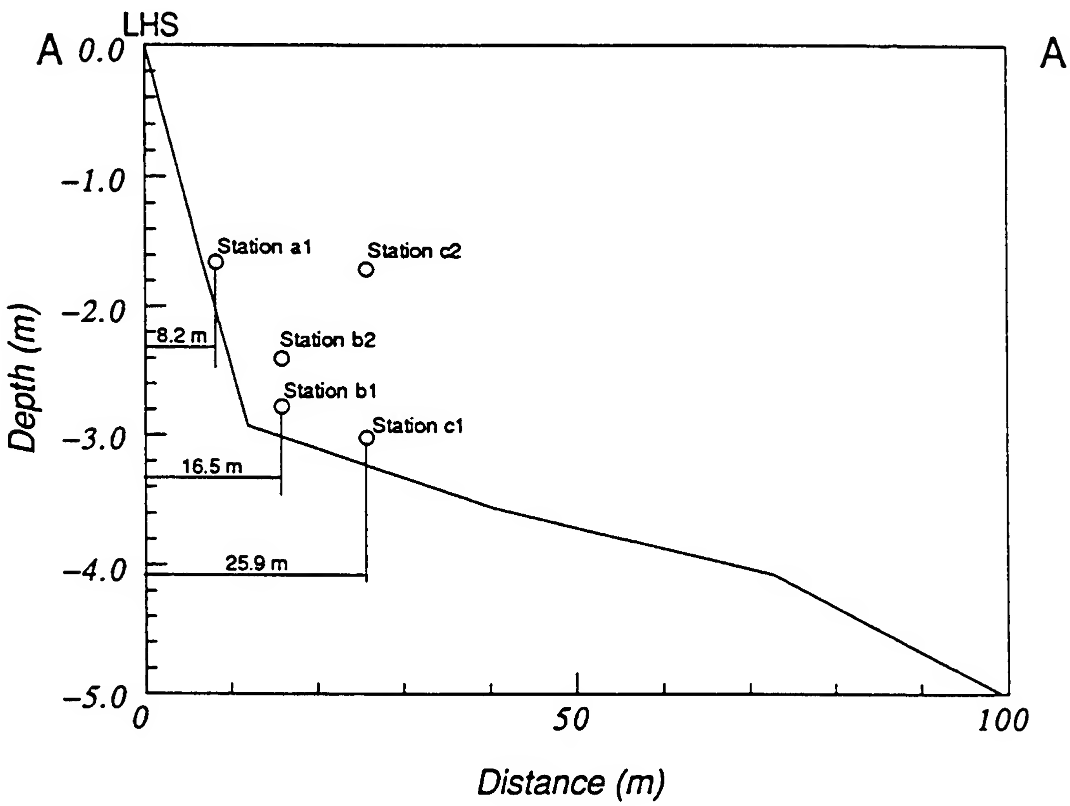
Stations d1 and d2 May 23, 1990



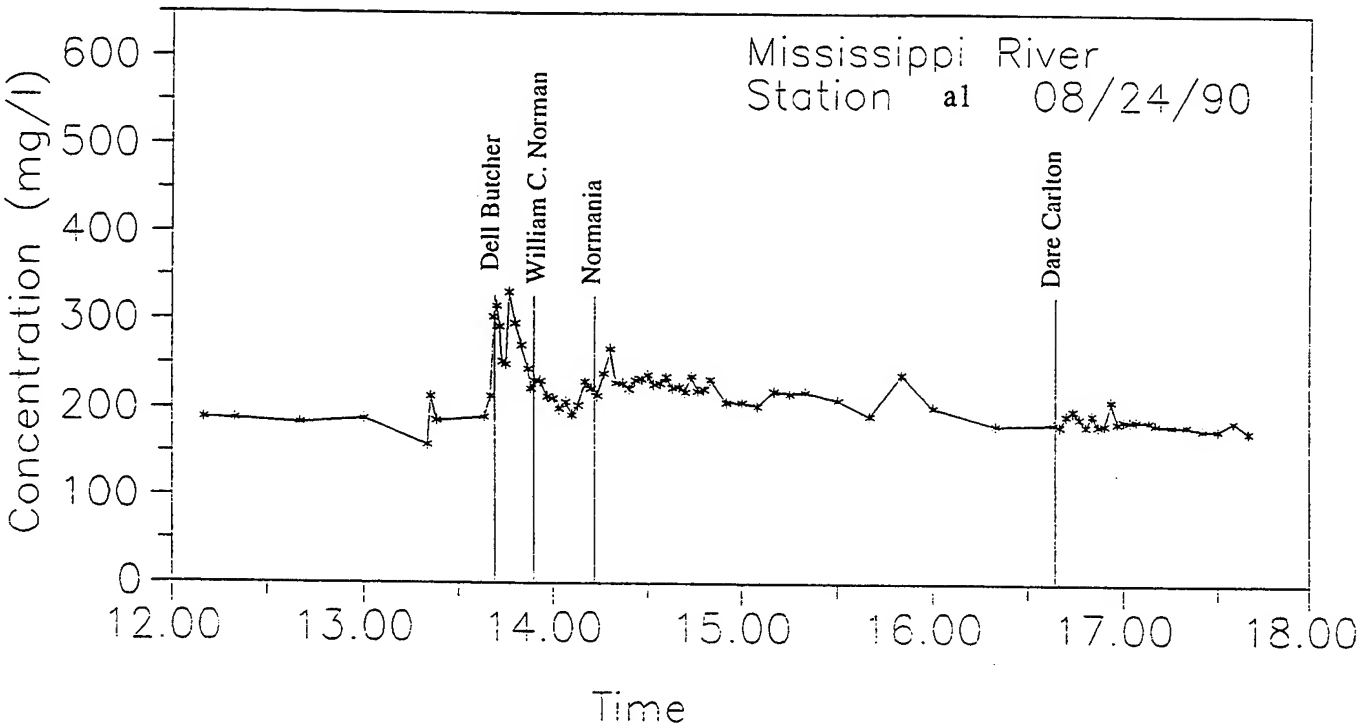


XXV-3. Variation of suspended sediment concentration with time, Goose Island, trip 1

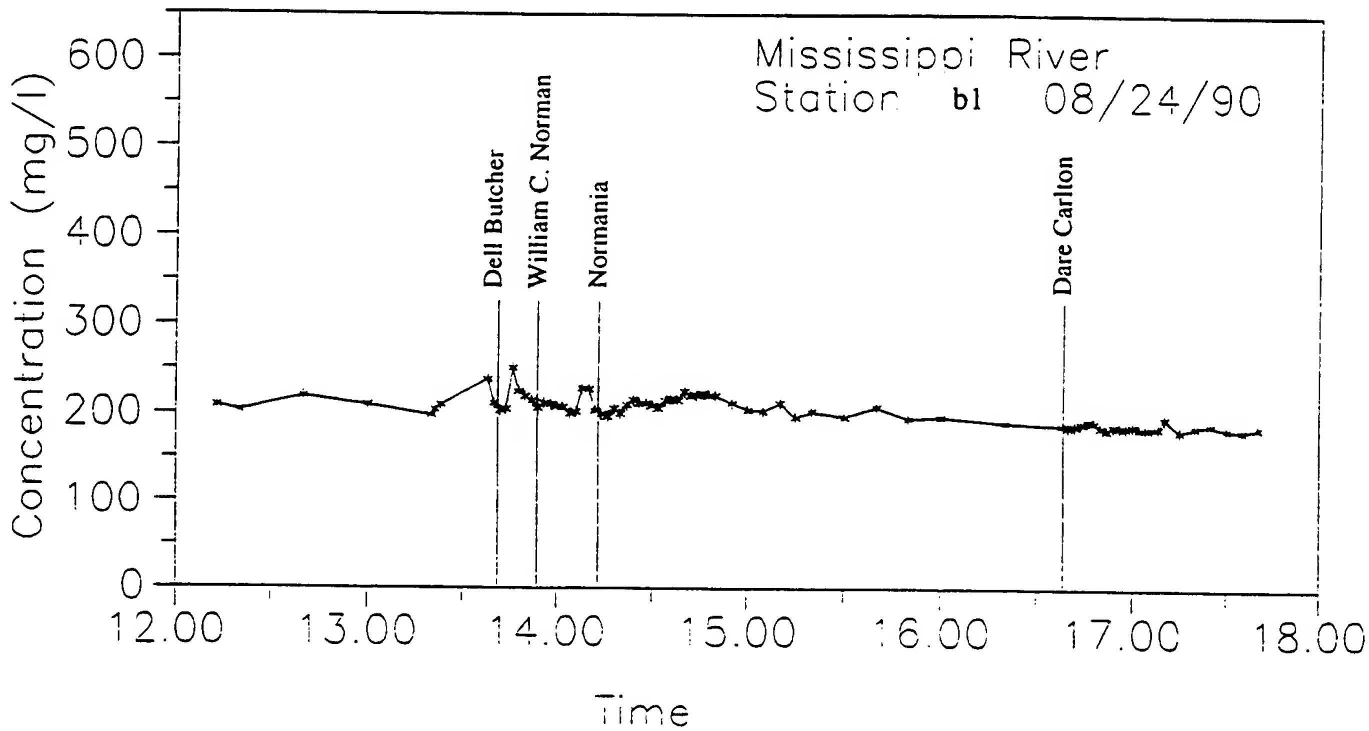
Location of suspended sediment sampling stations on the Mississippi River near the Goose Island site during August 20-29, 1990 (trip 1)

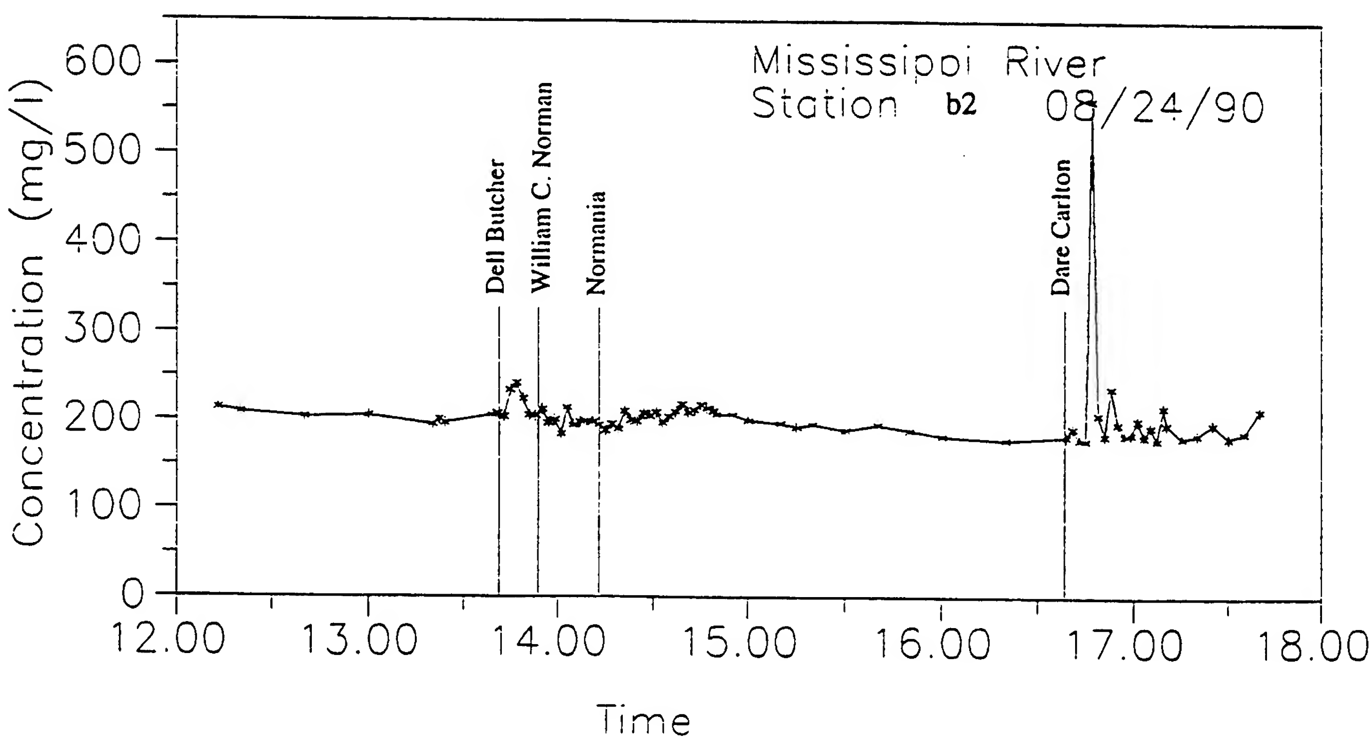


Station a1 August 24, 1990

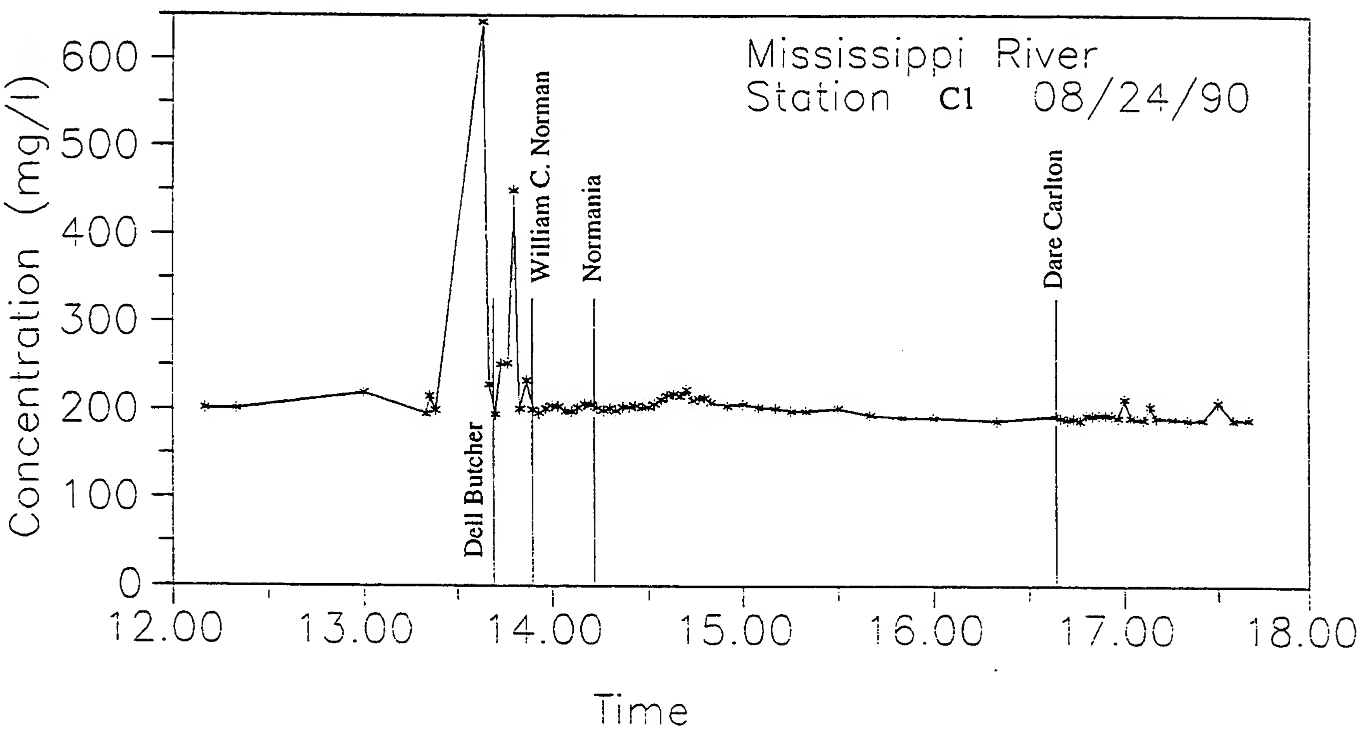


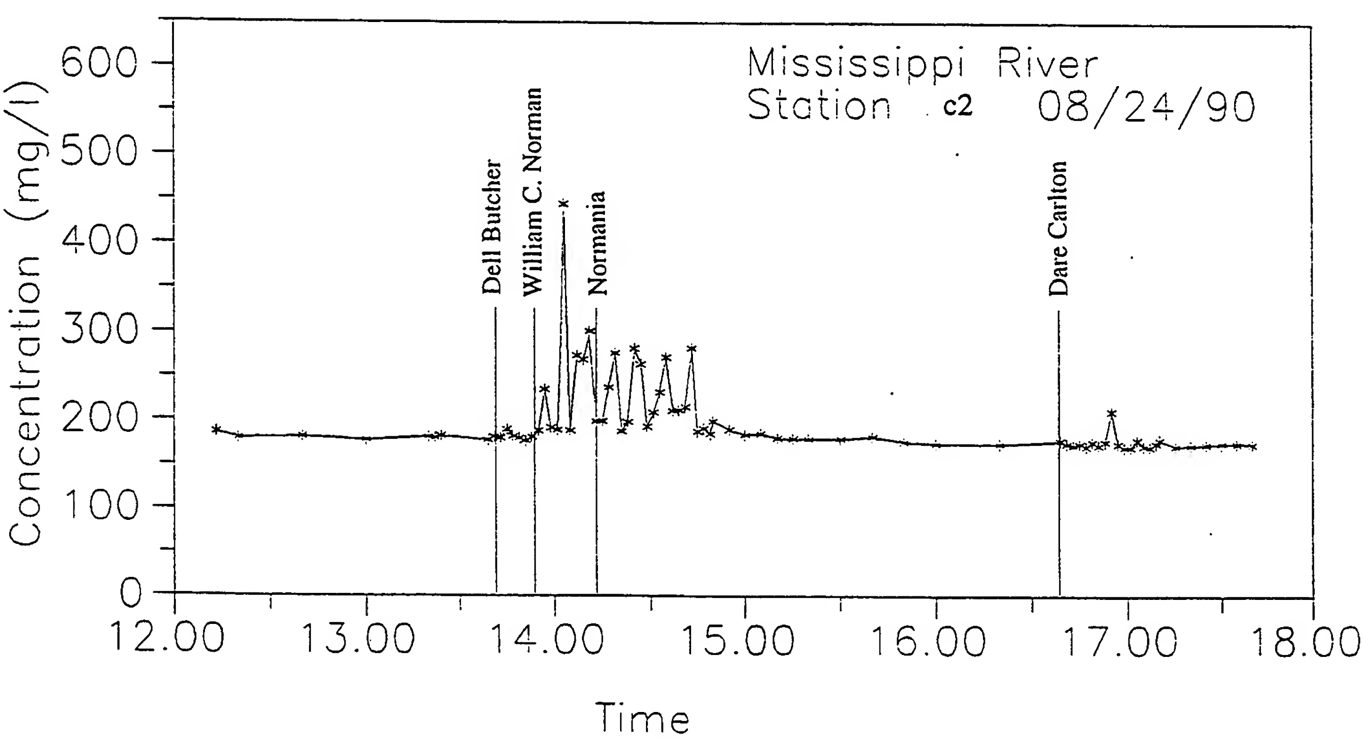
Stations b1 and b2 August 24, 1990



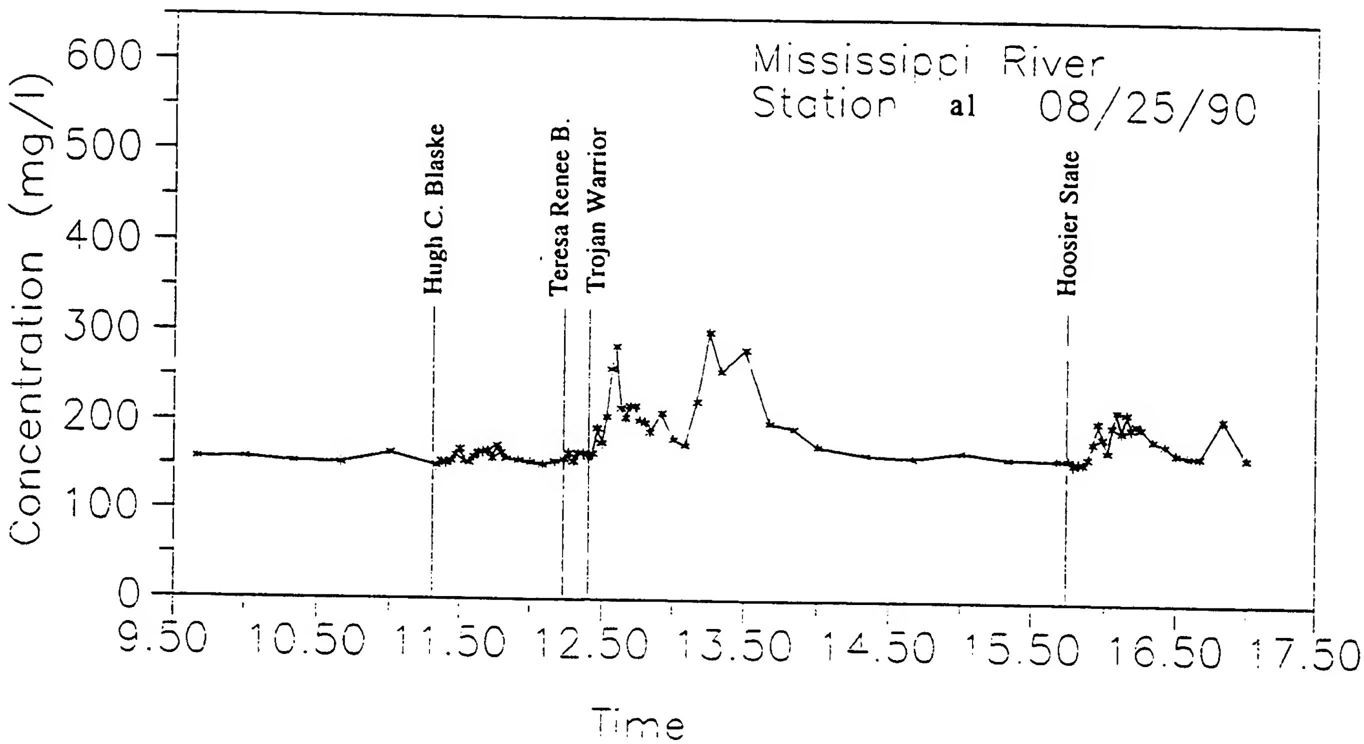


Stations c1 and c2 August 24, 1990

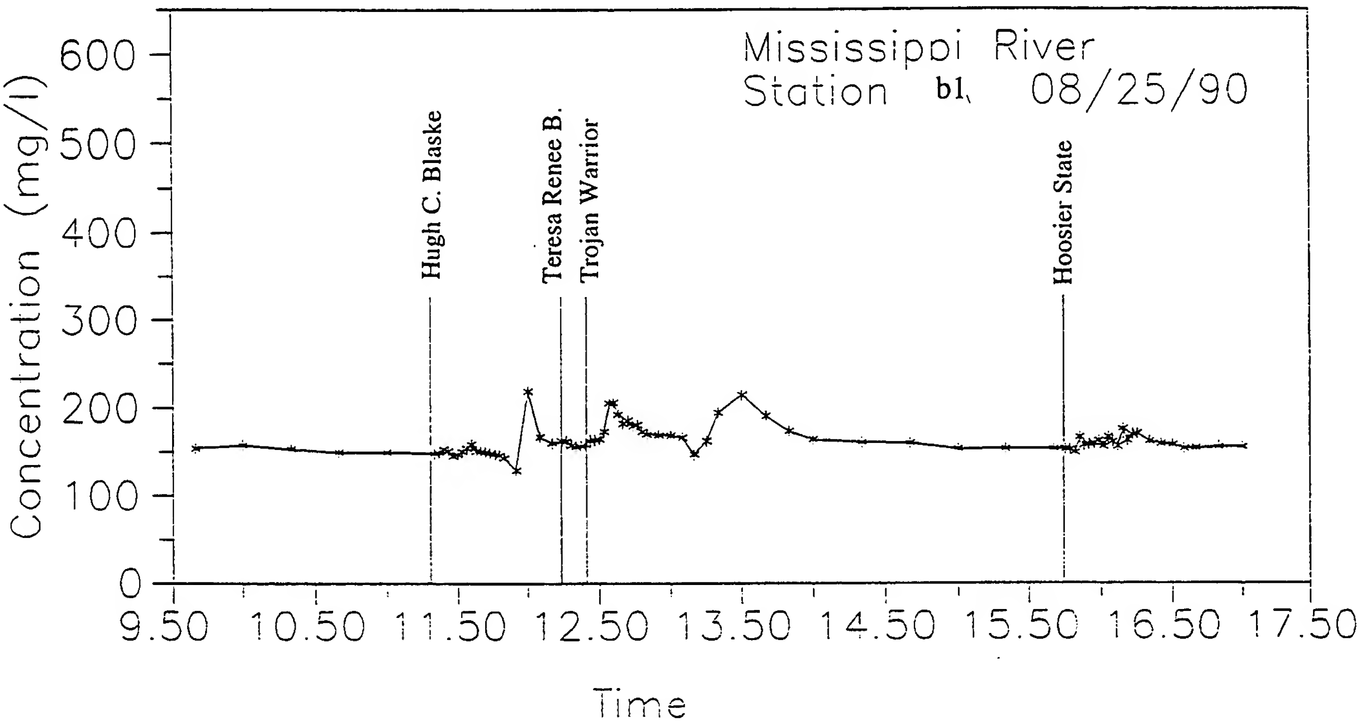


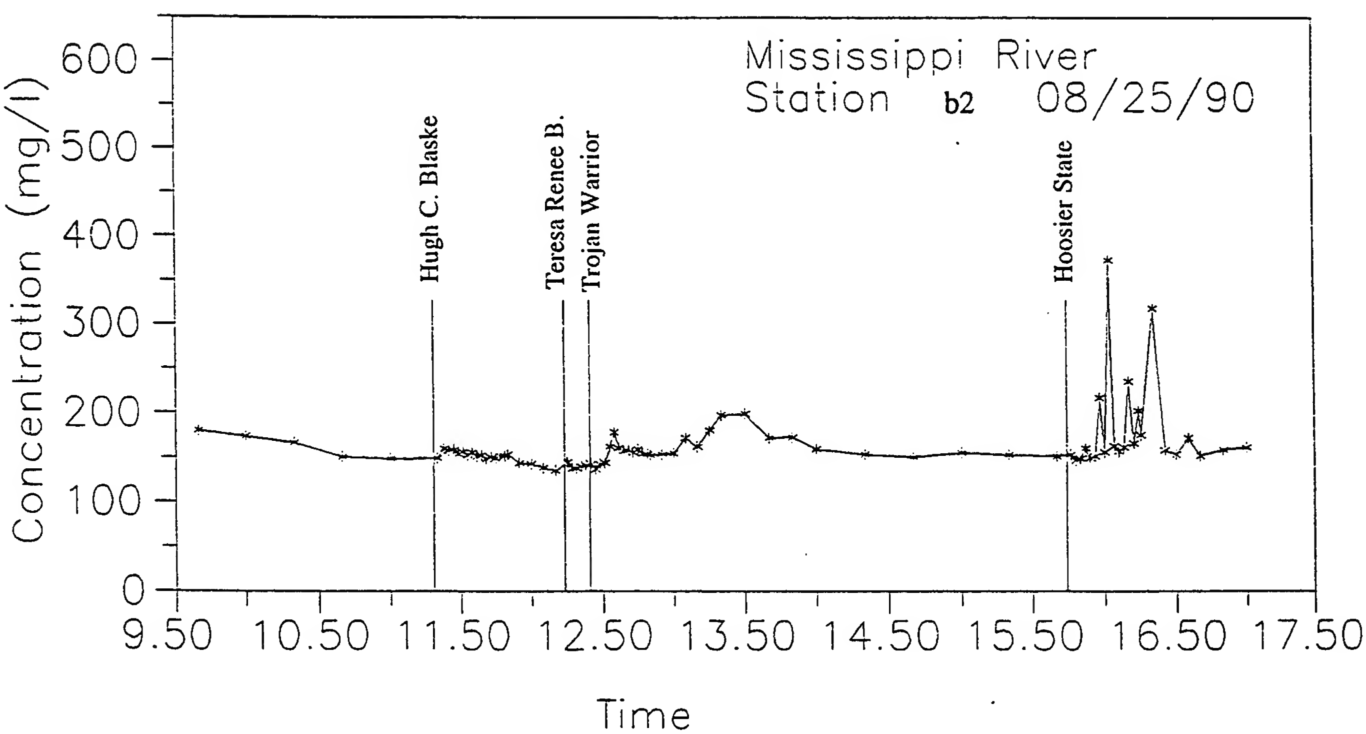


Station a1 August 25, 1990

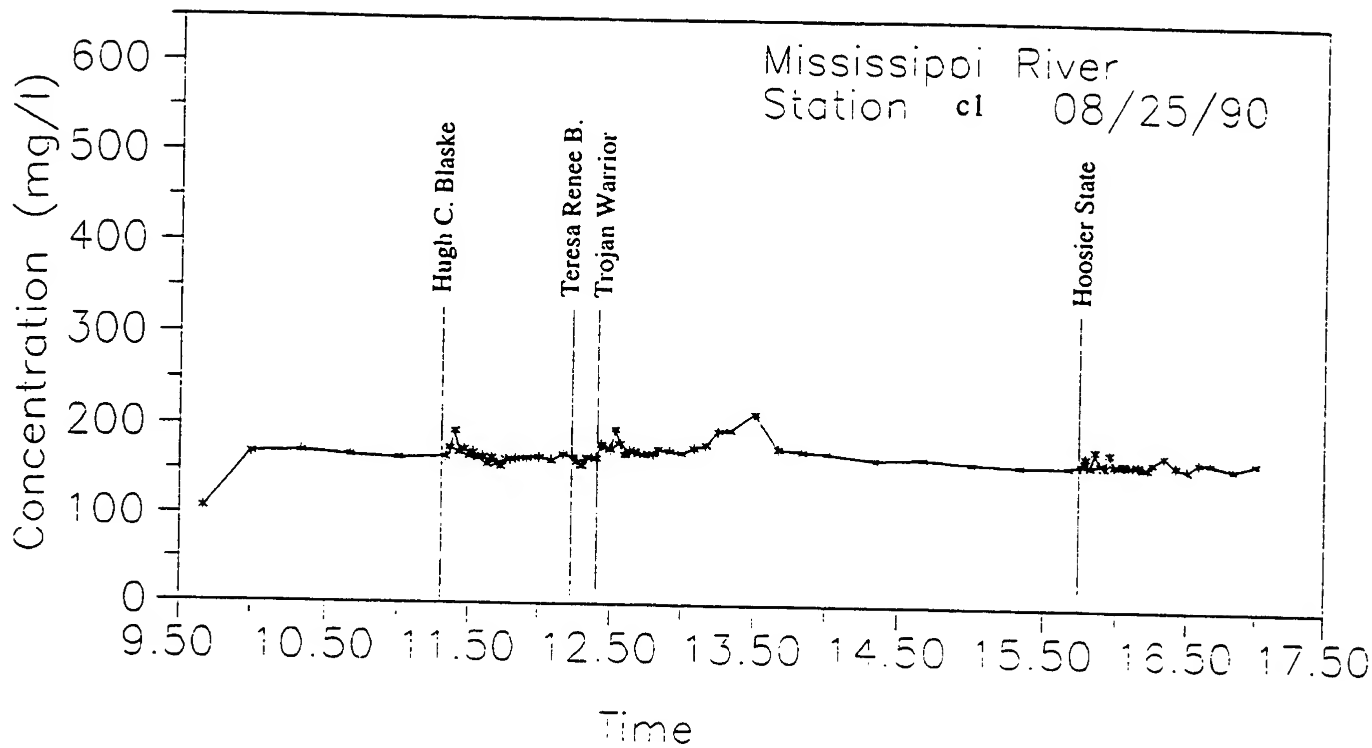


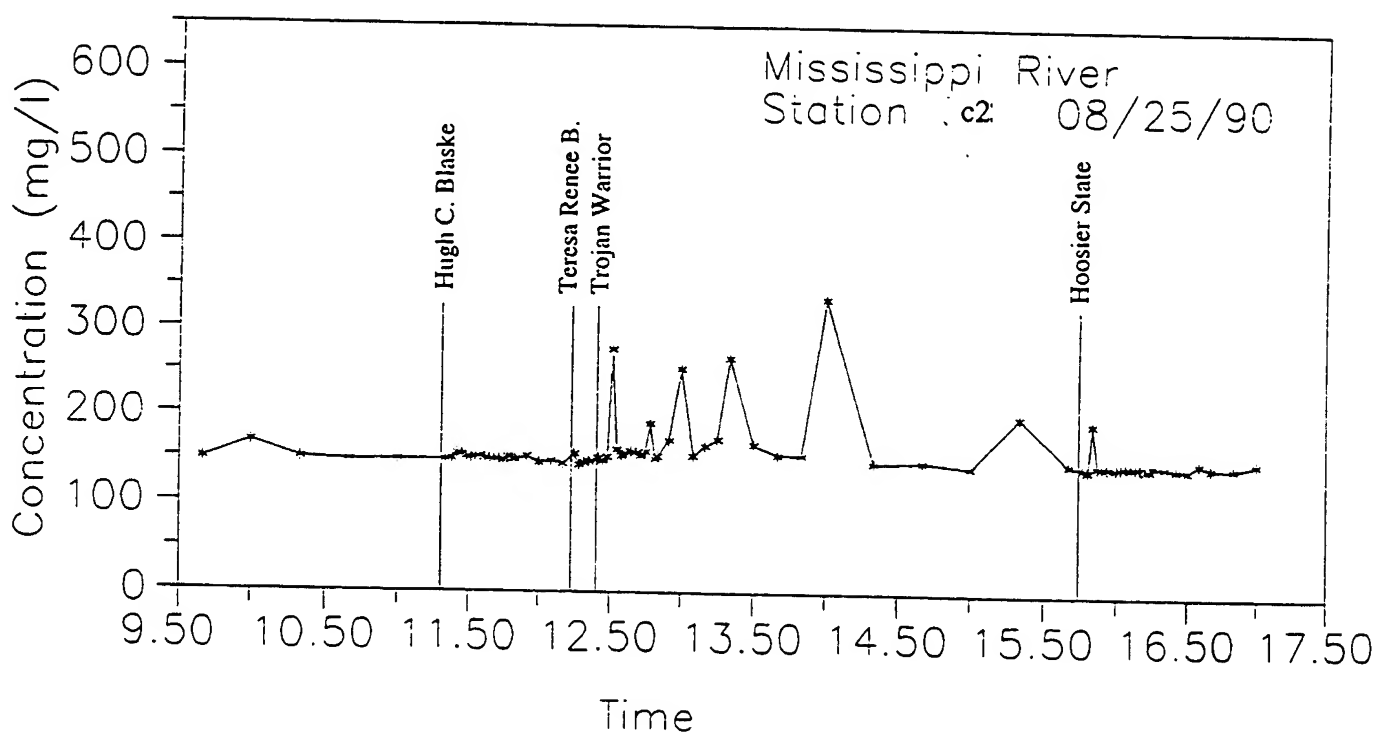
Stations b1 and b2 August 25, 1990



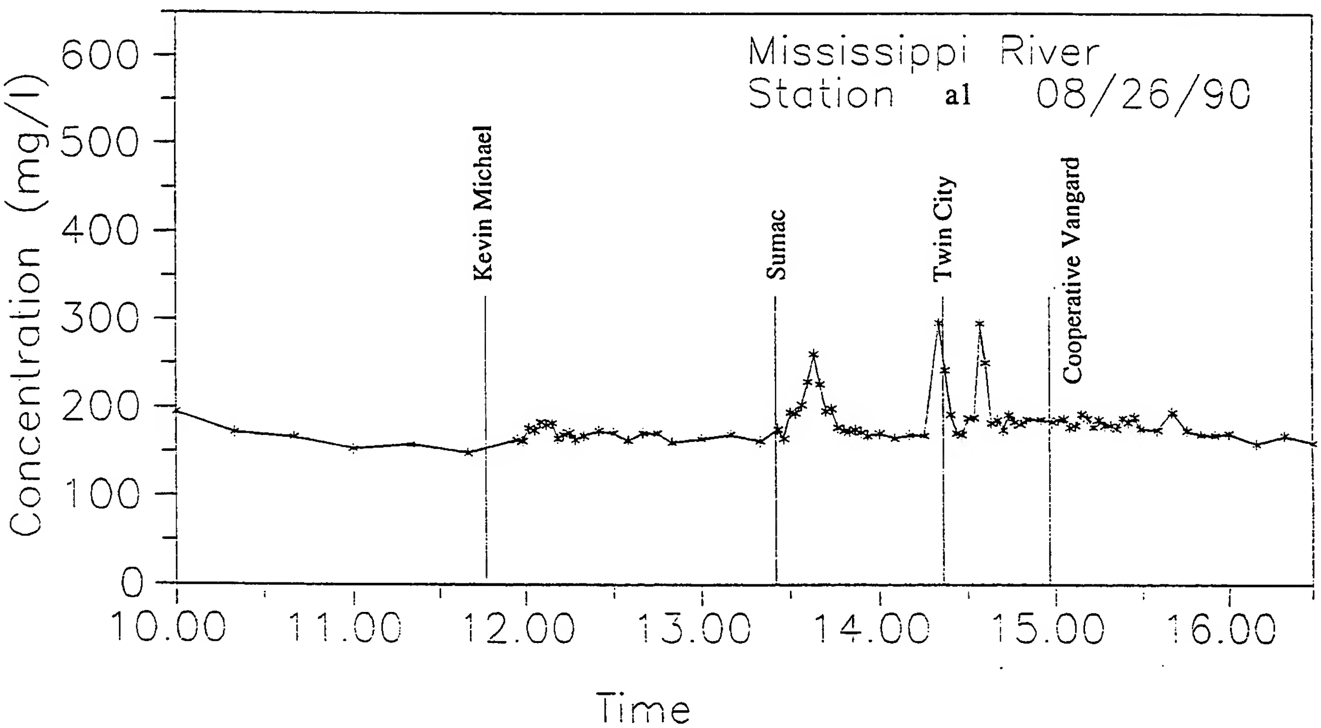


Stations c1 and c2   August 25, 1990

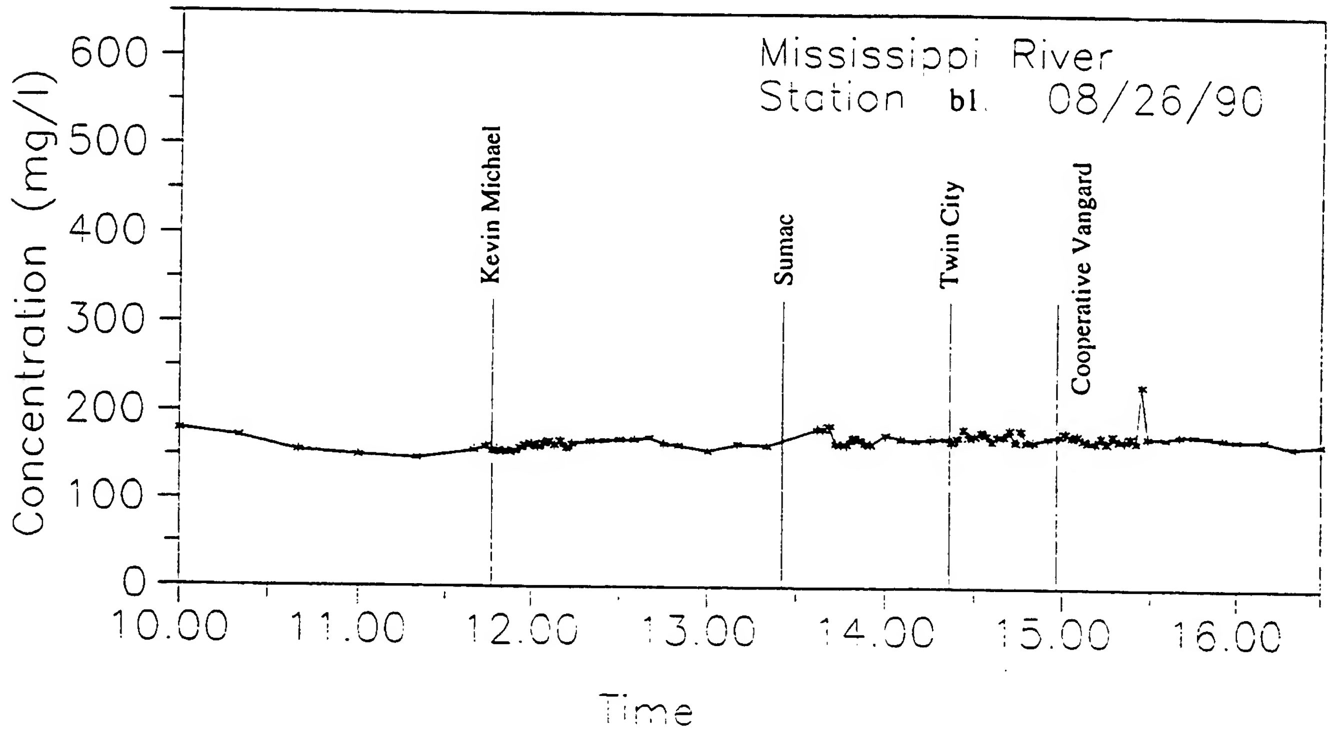


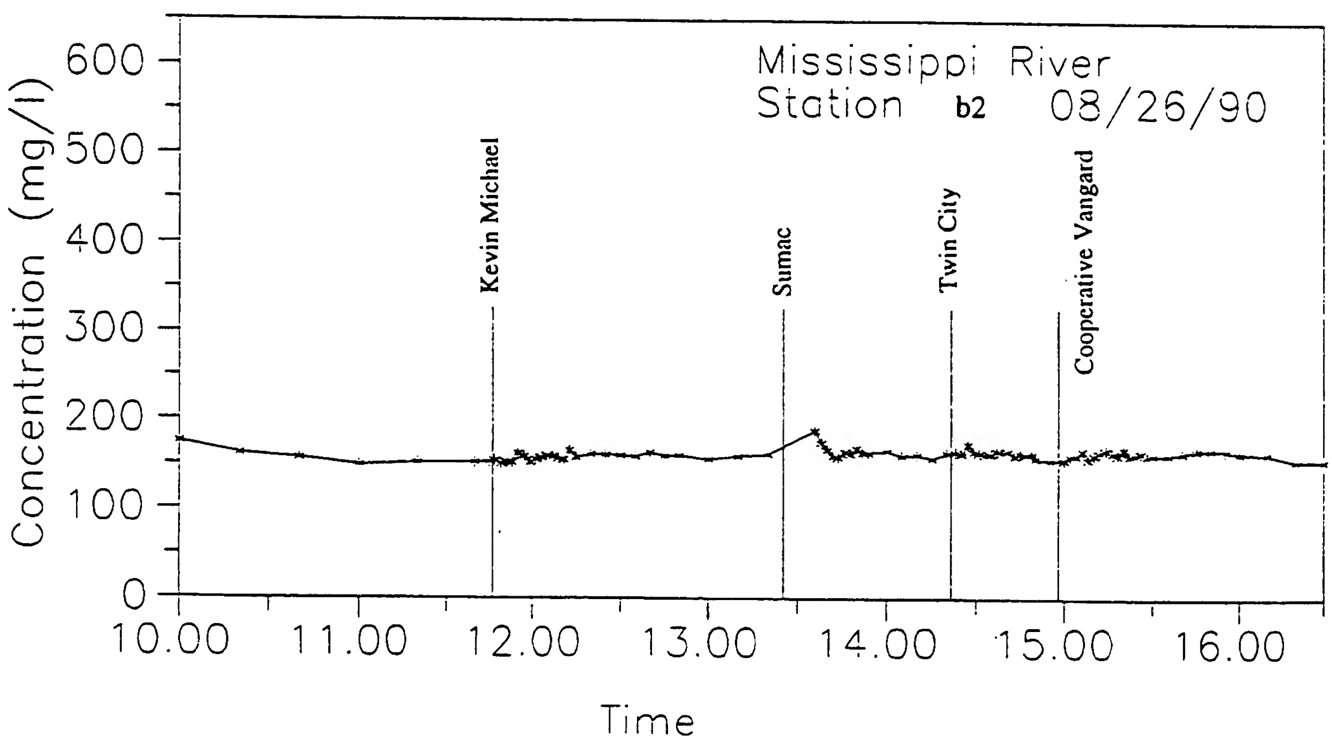


Station a1 August 26, 1990

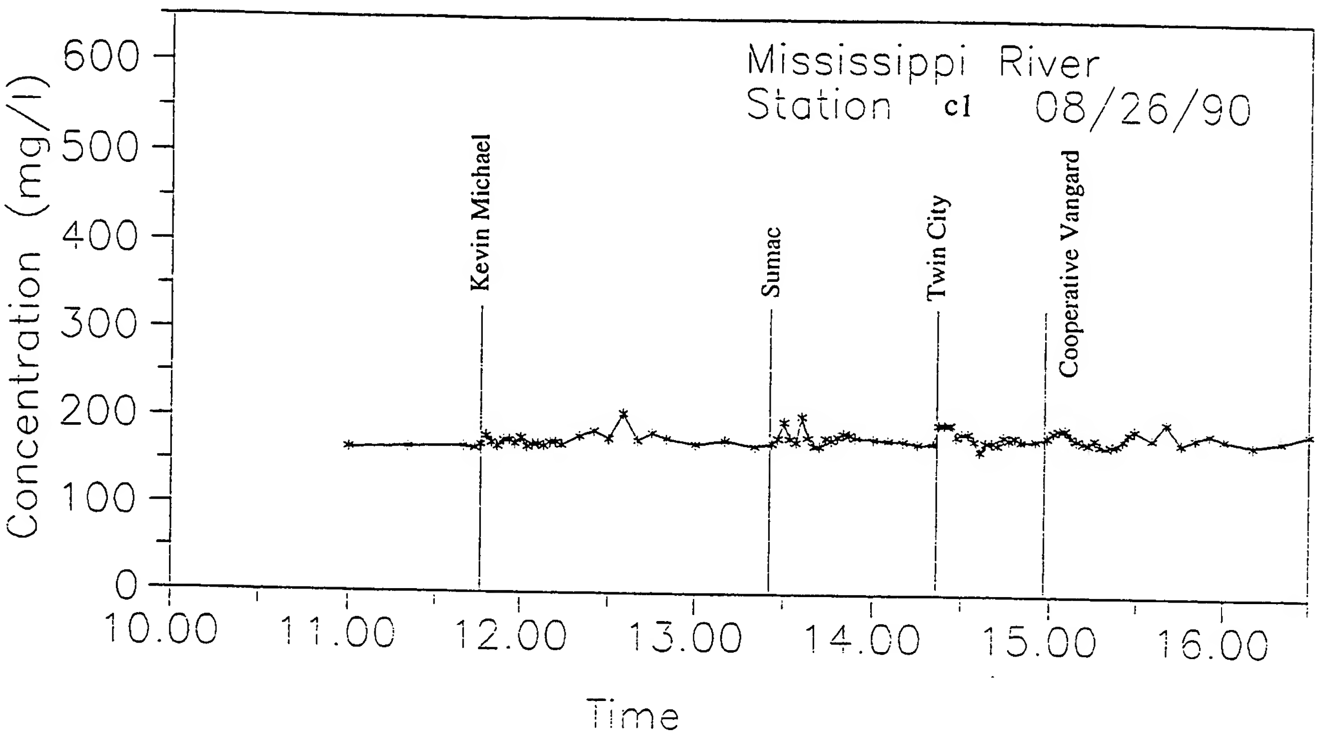


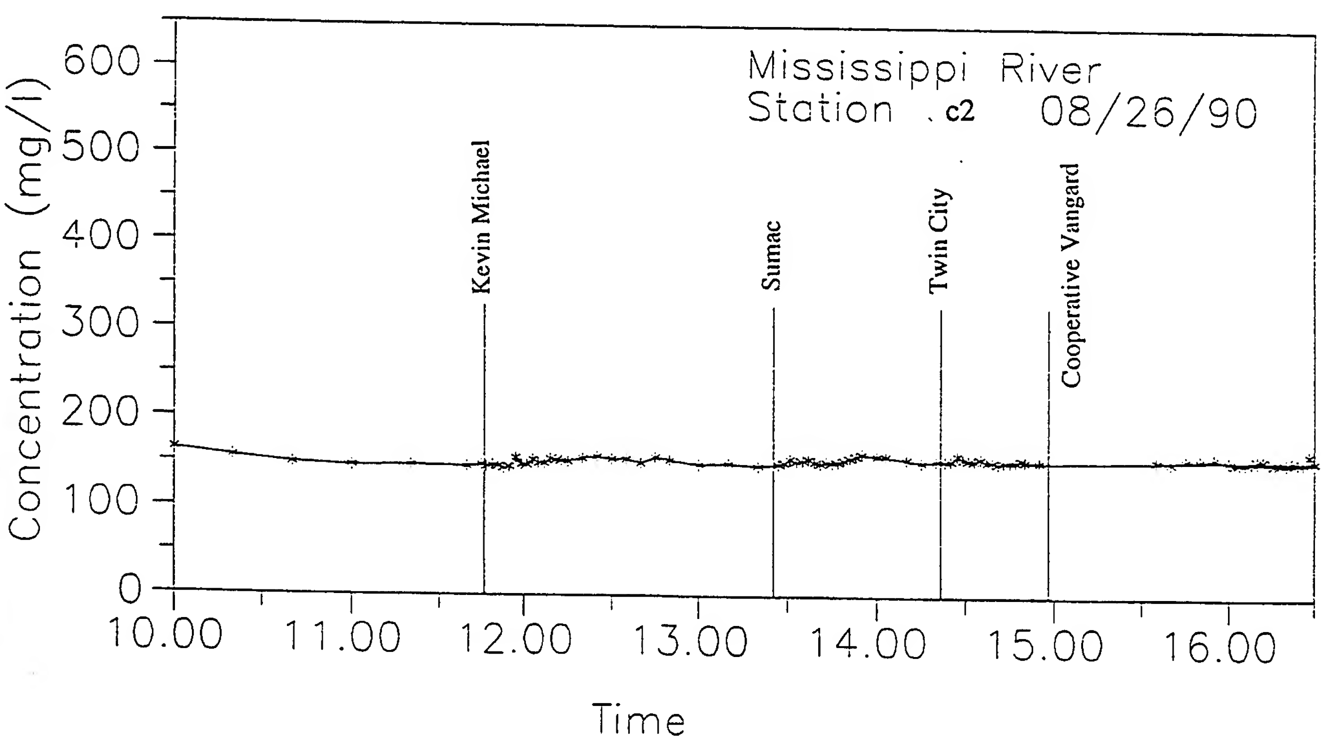
Stations b1 and b2 August 26, 1990



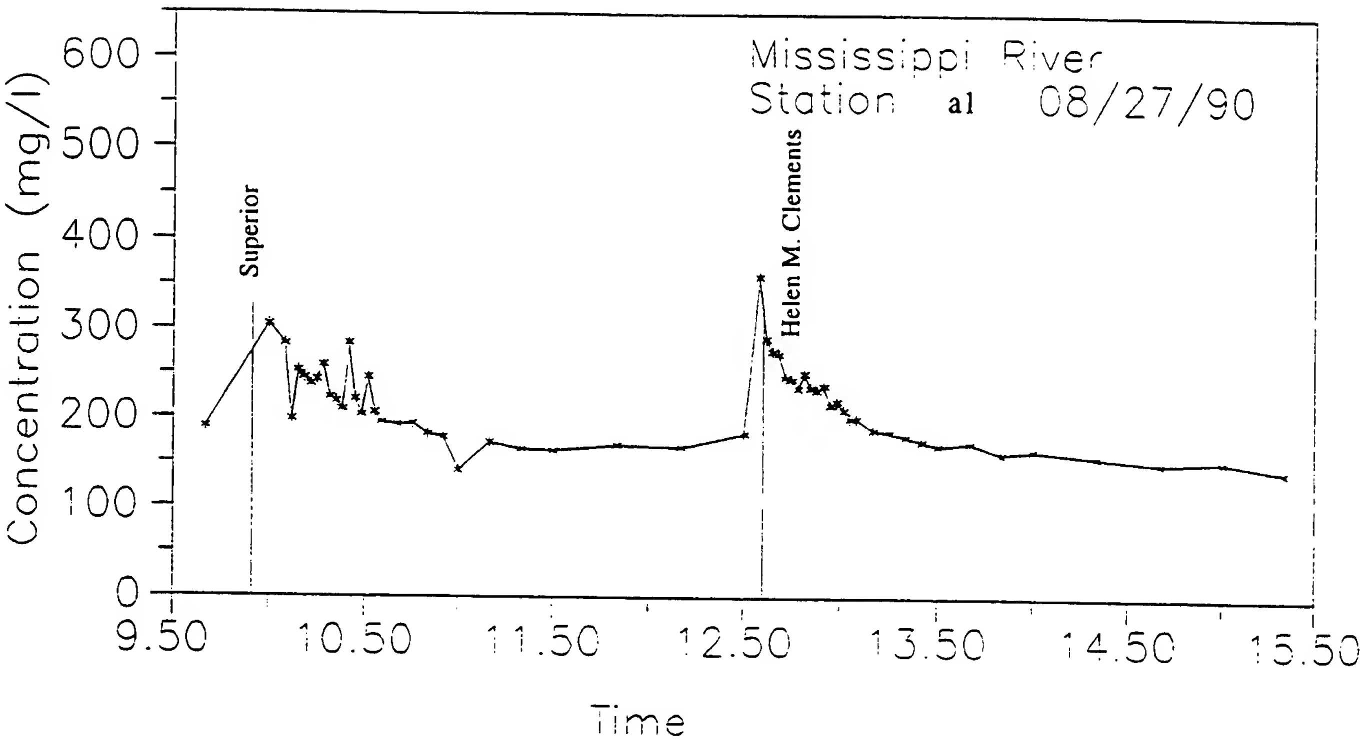


Stations c1 and c2 August 26, 1990

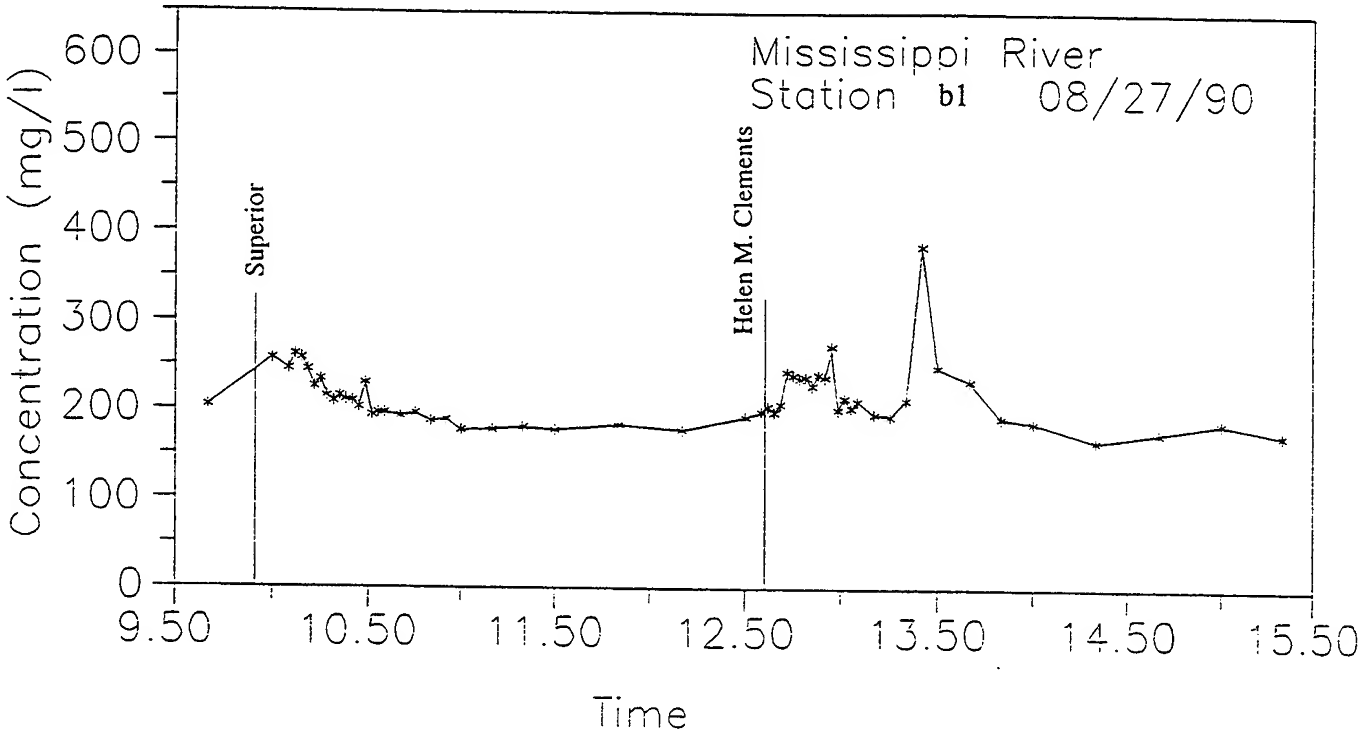


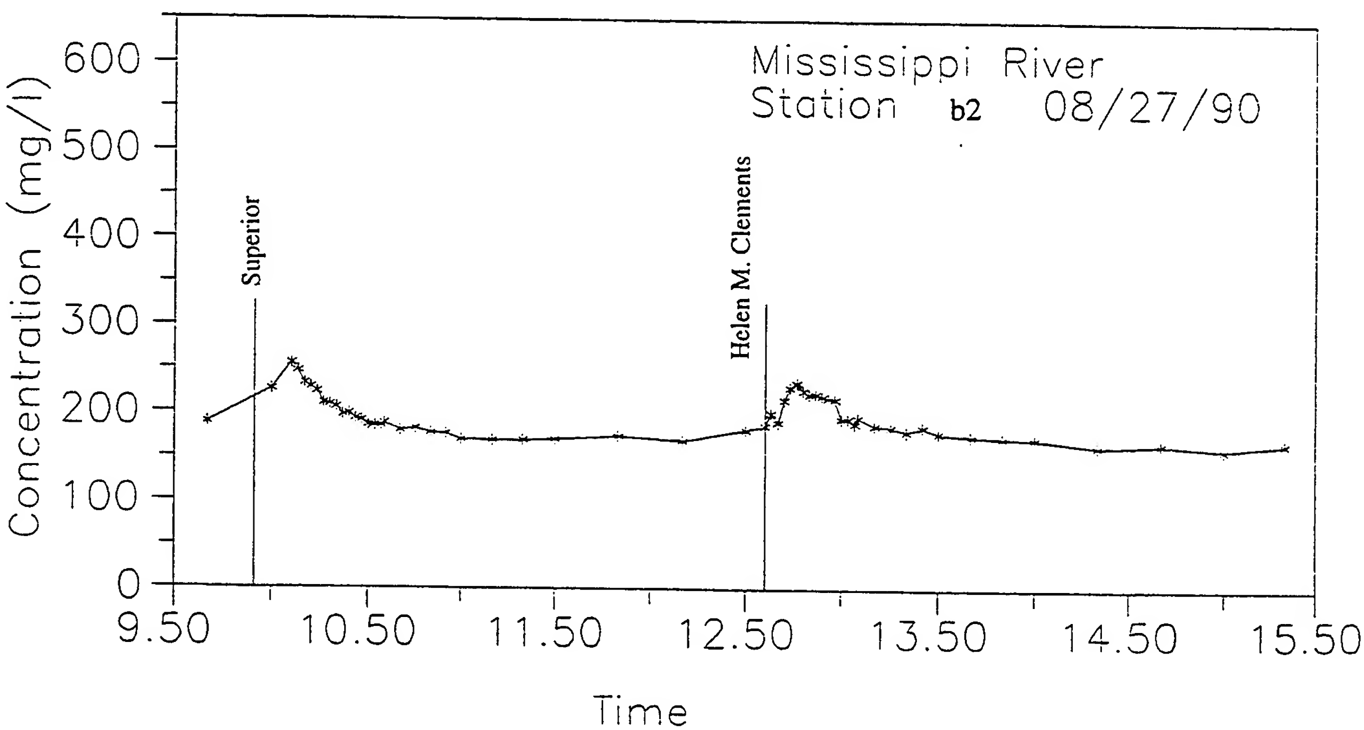


Station a1 August 27, 1990

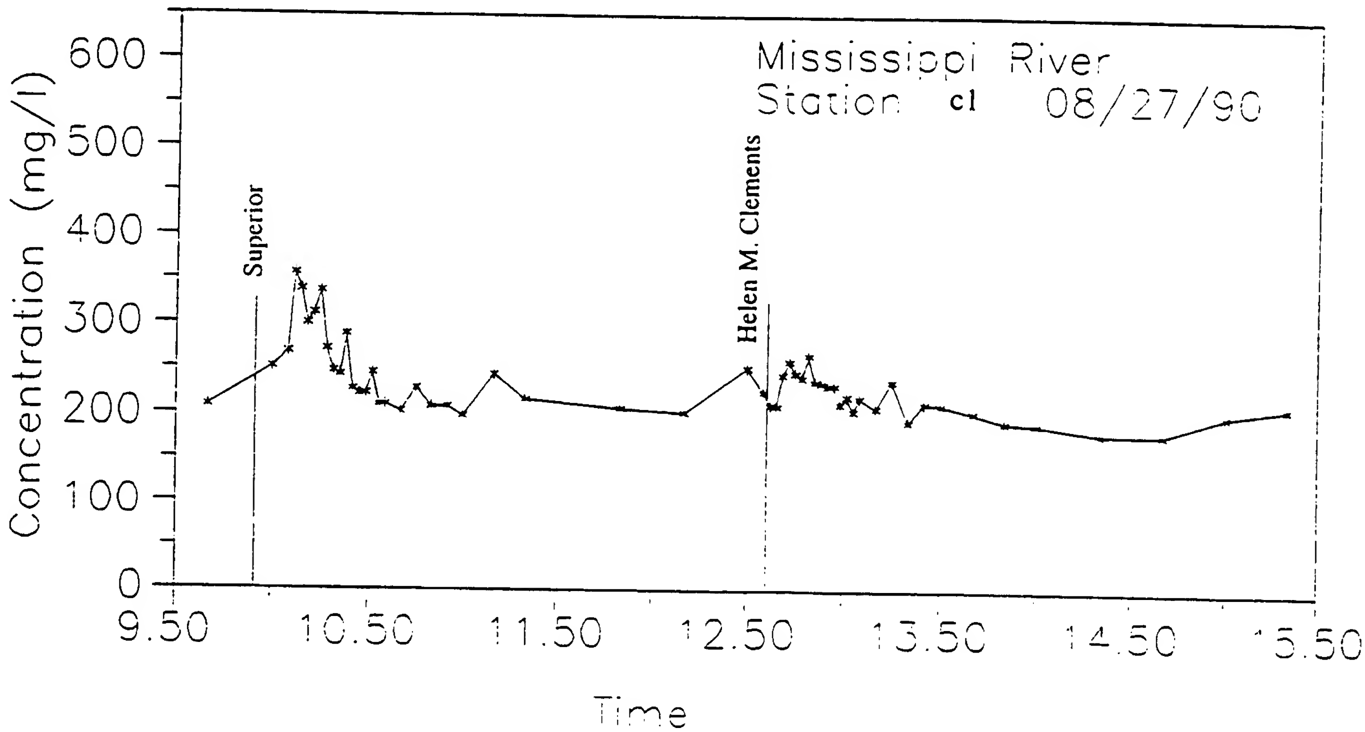


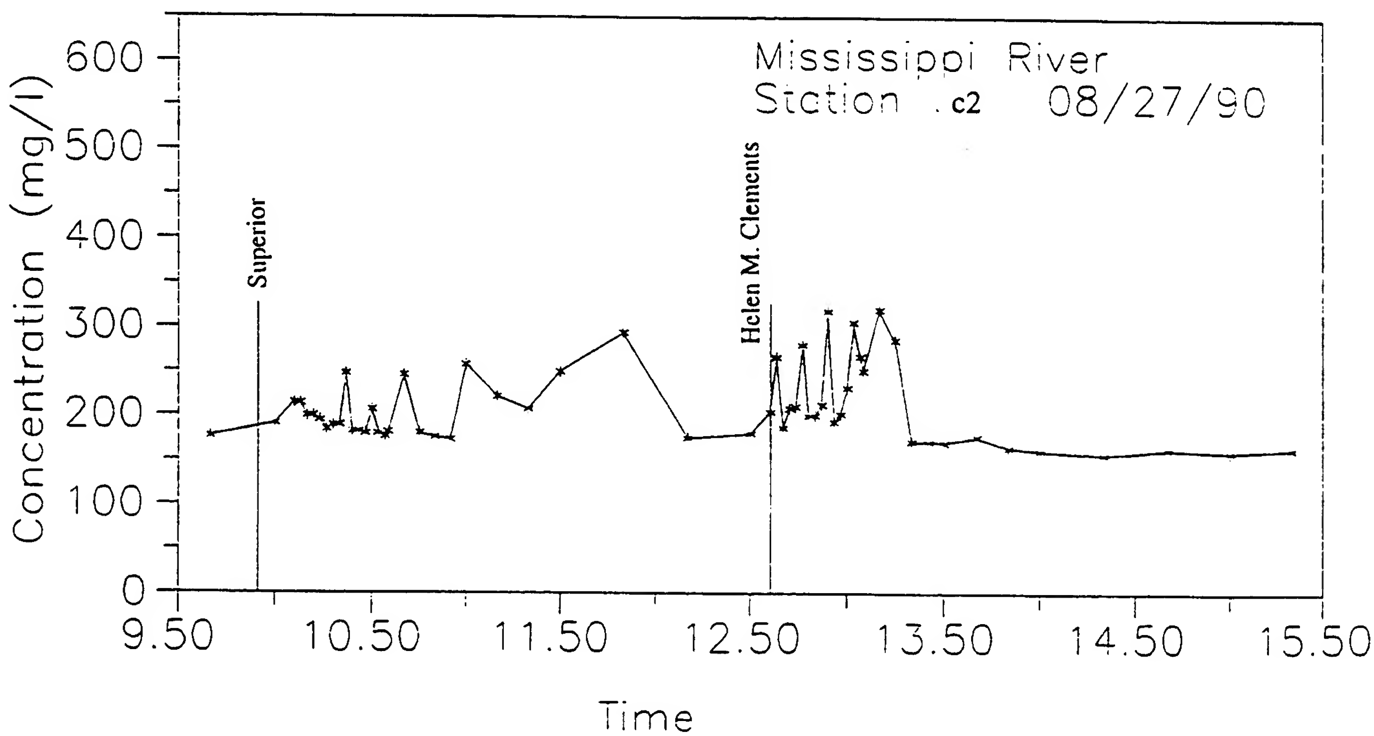
Stations b1 and b2 August 27, 1990





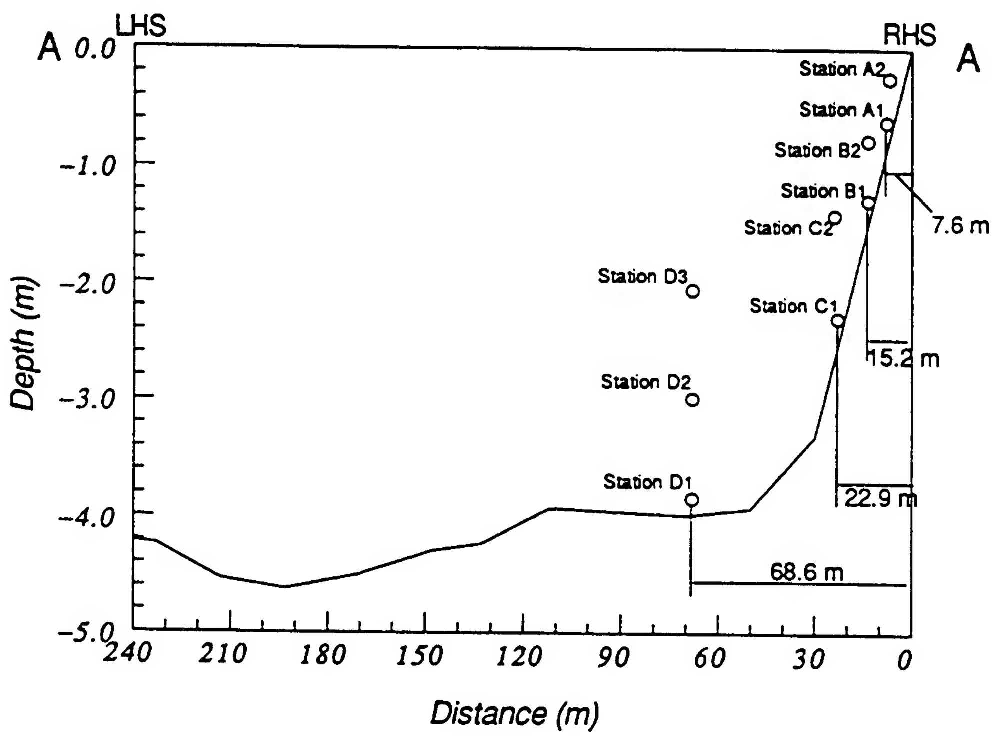
Stations c1 and c2   August 27, 1990



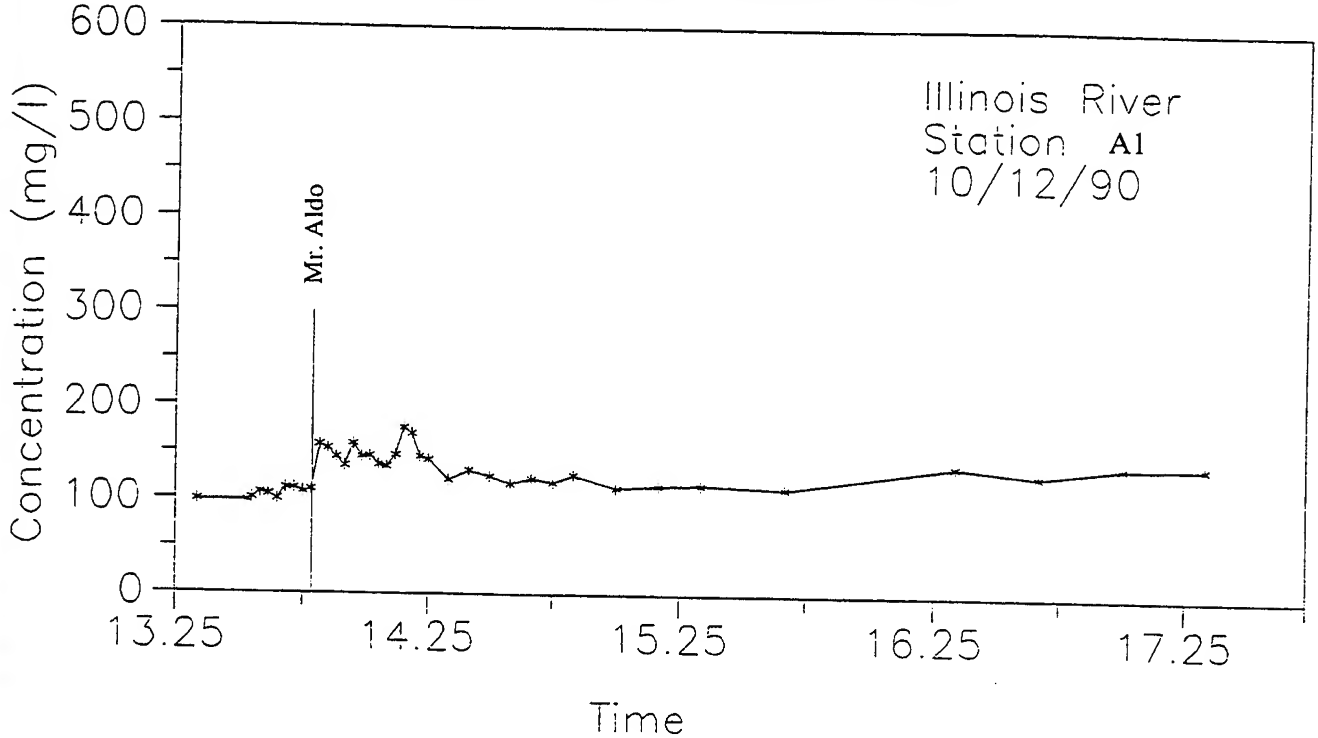


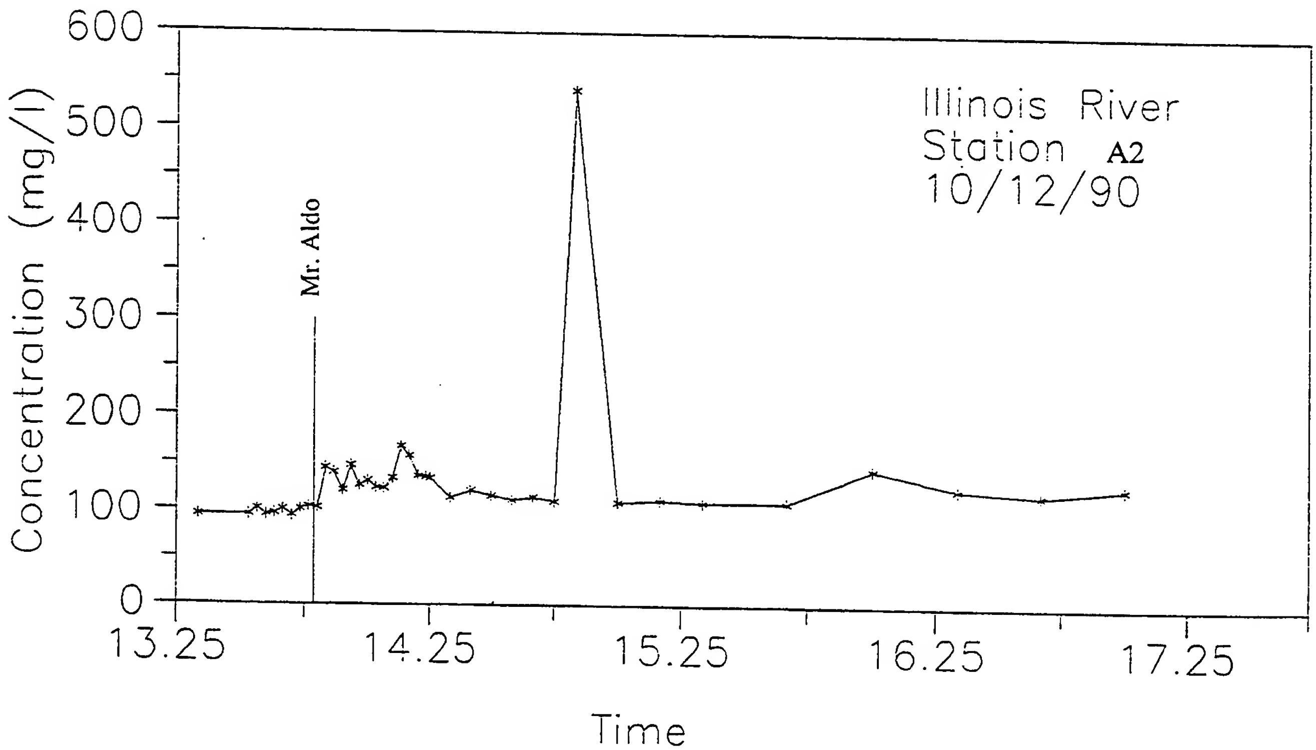
XXV-4. Variation of suspended sediment concentration with time, Kampsville, trip 1

Location of suspended sediment sampling stations on the Illinois River near the Kampsville site during October 9-18, 1990 (trip 1)

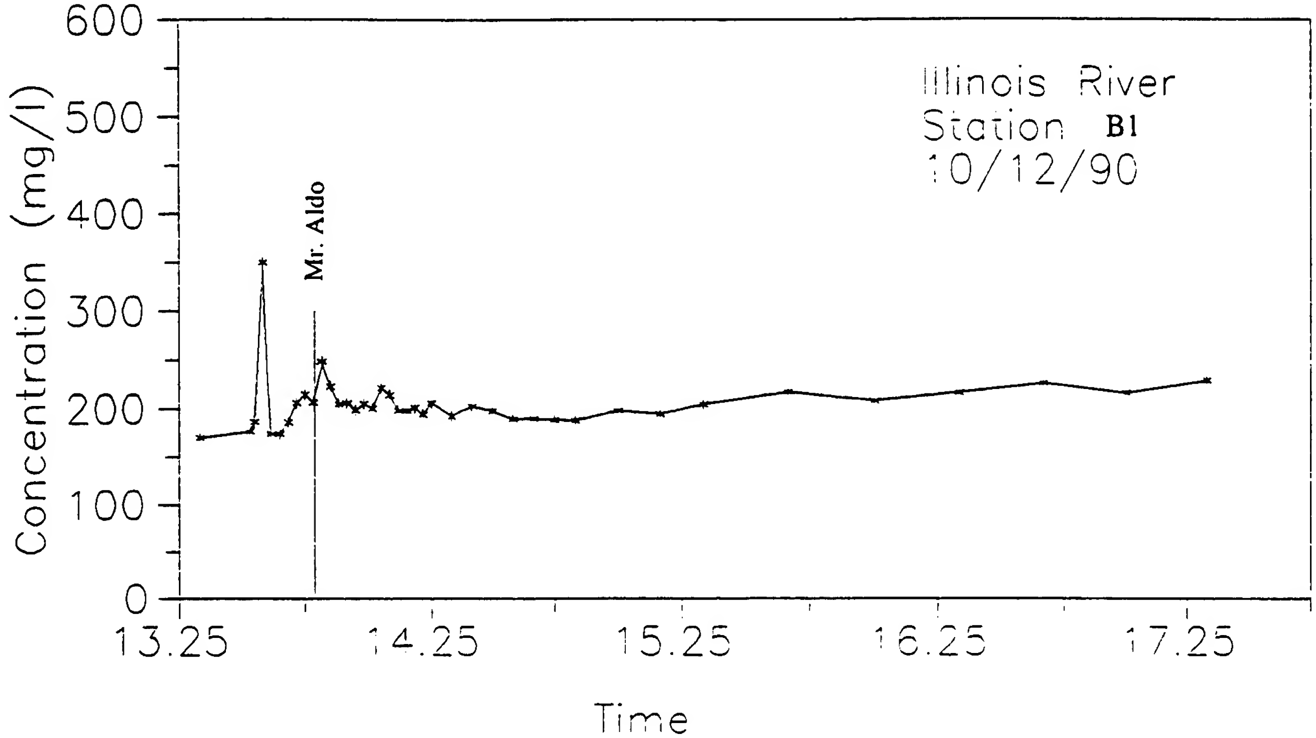


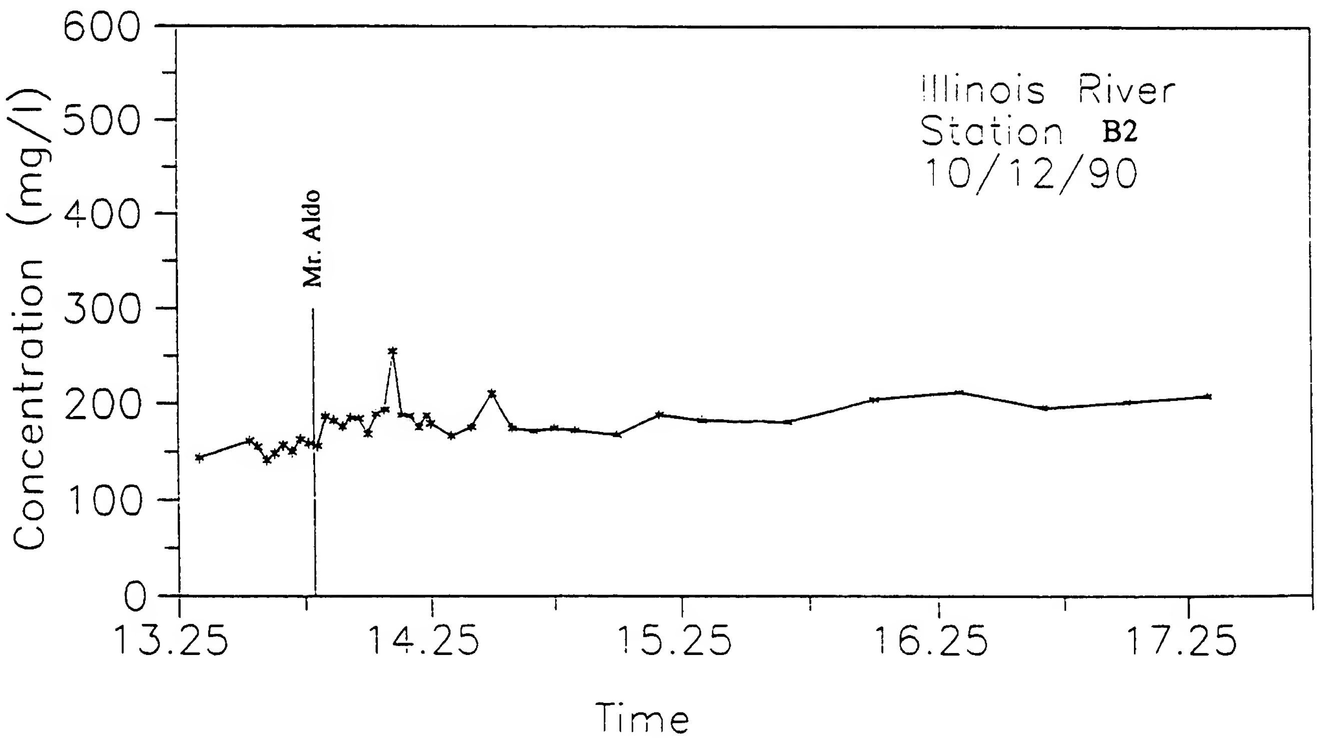
Stations A1 and A2 October 12, 1990



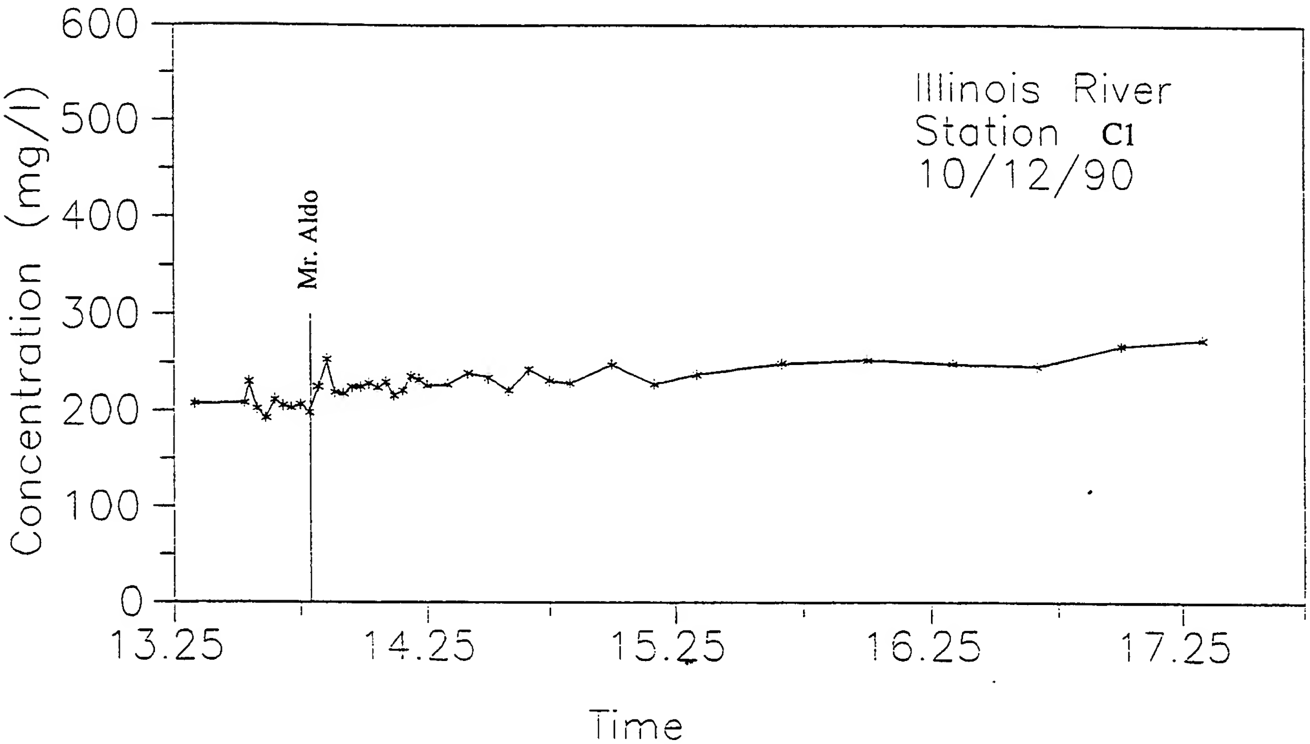


Stations B1 and B2   October 12, 1990

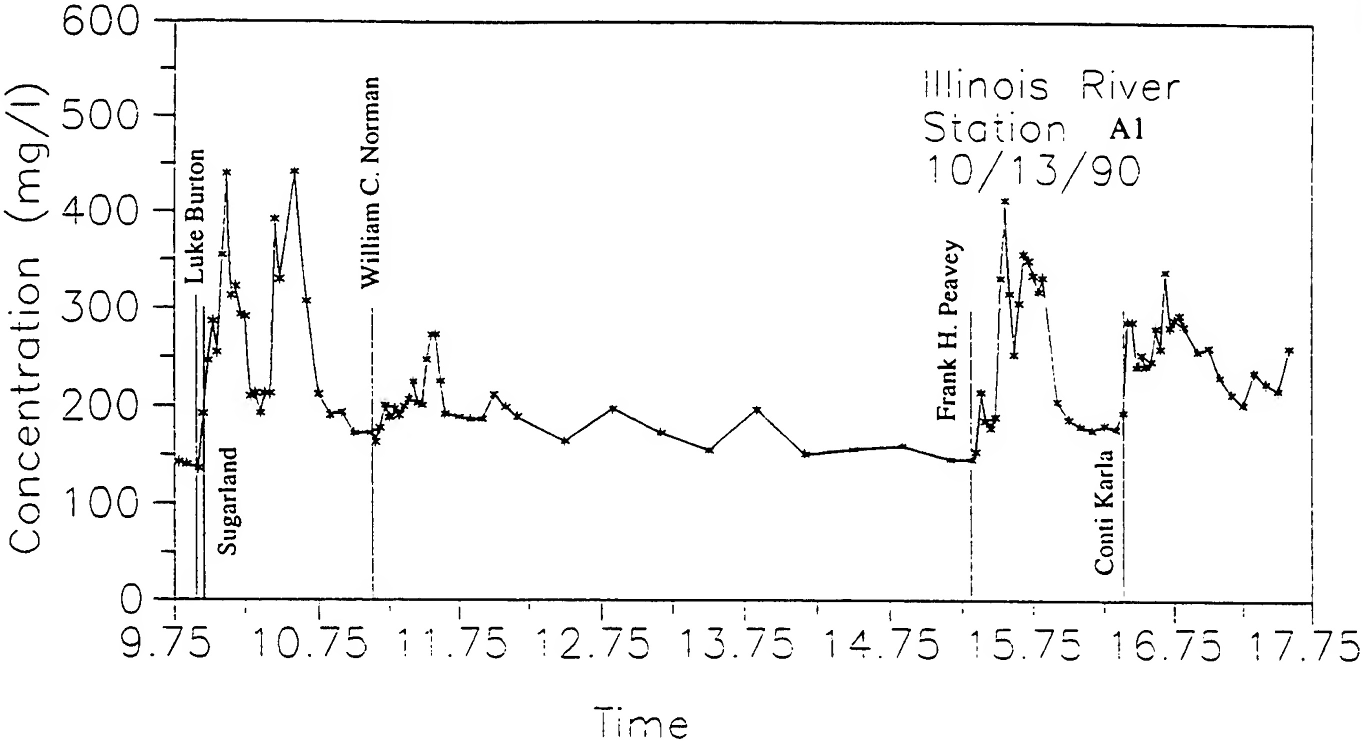


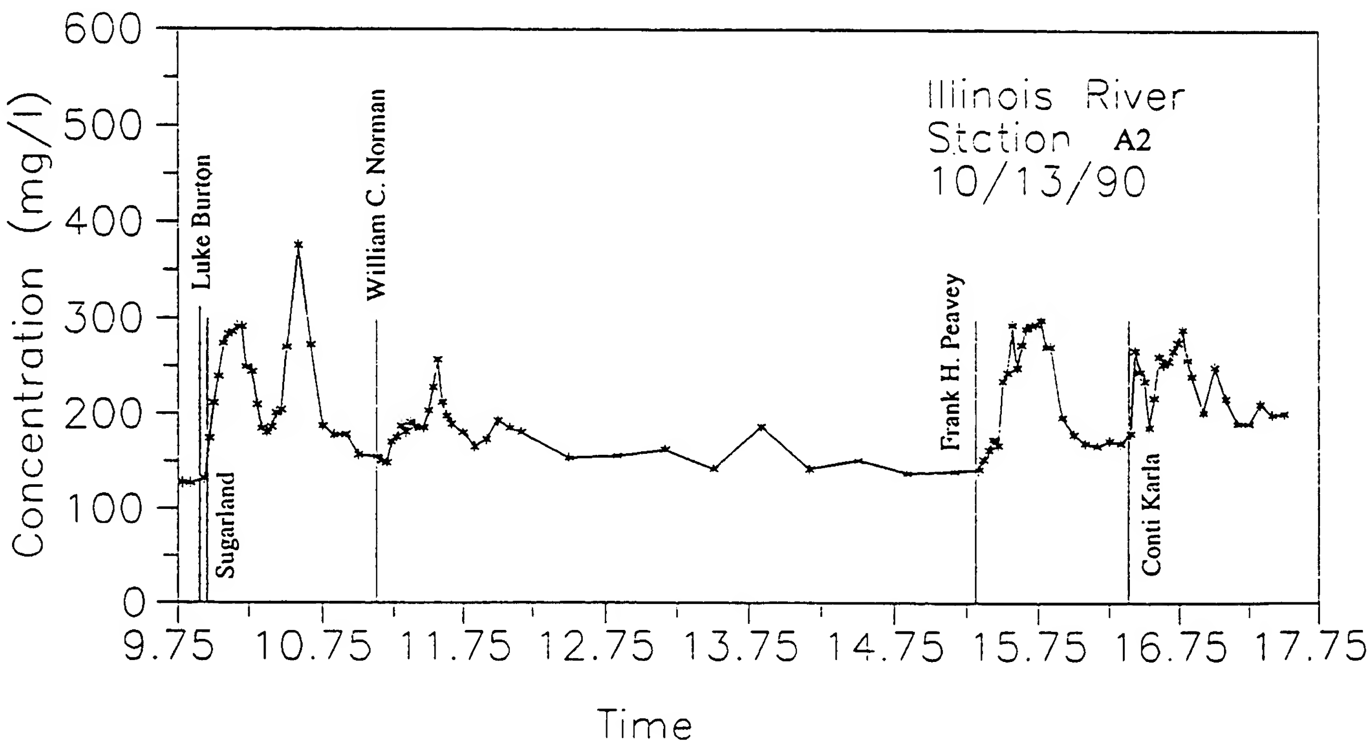


Station C1 October 12, 1990

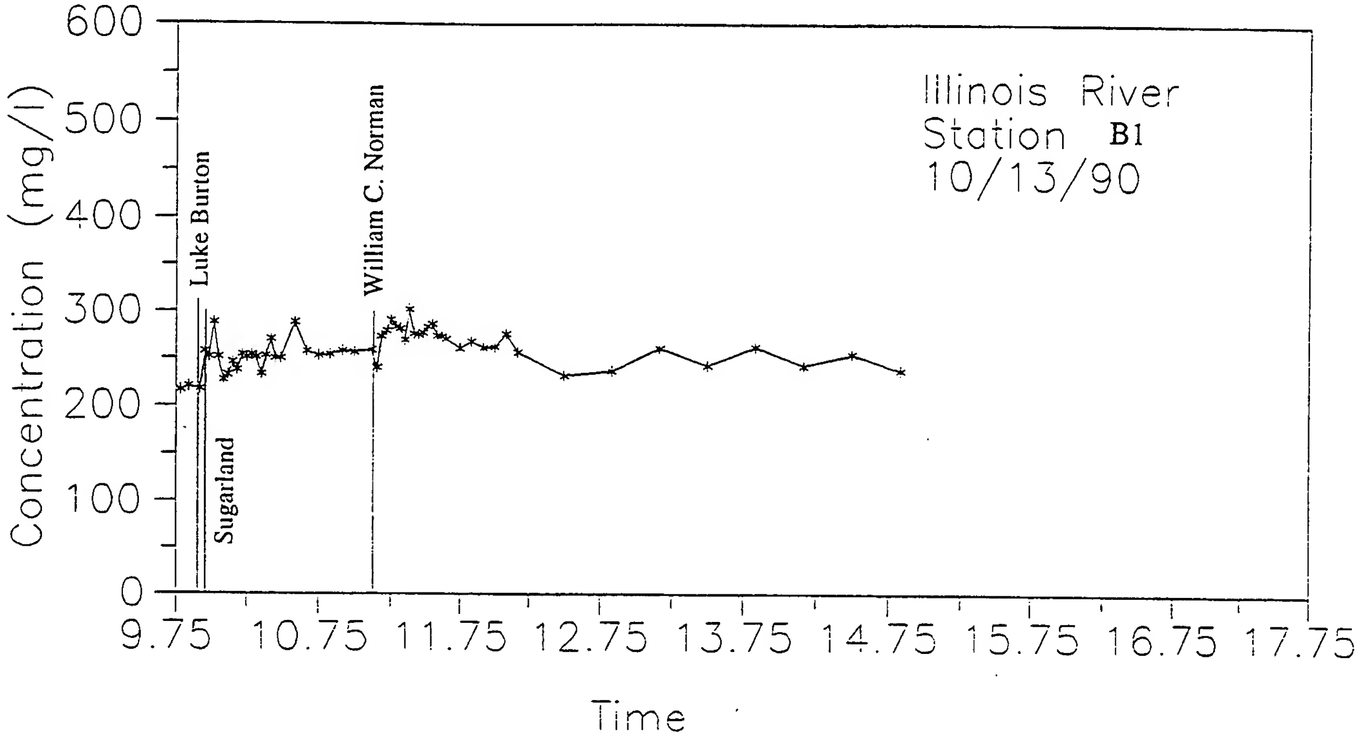


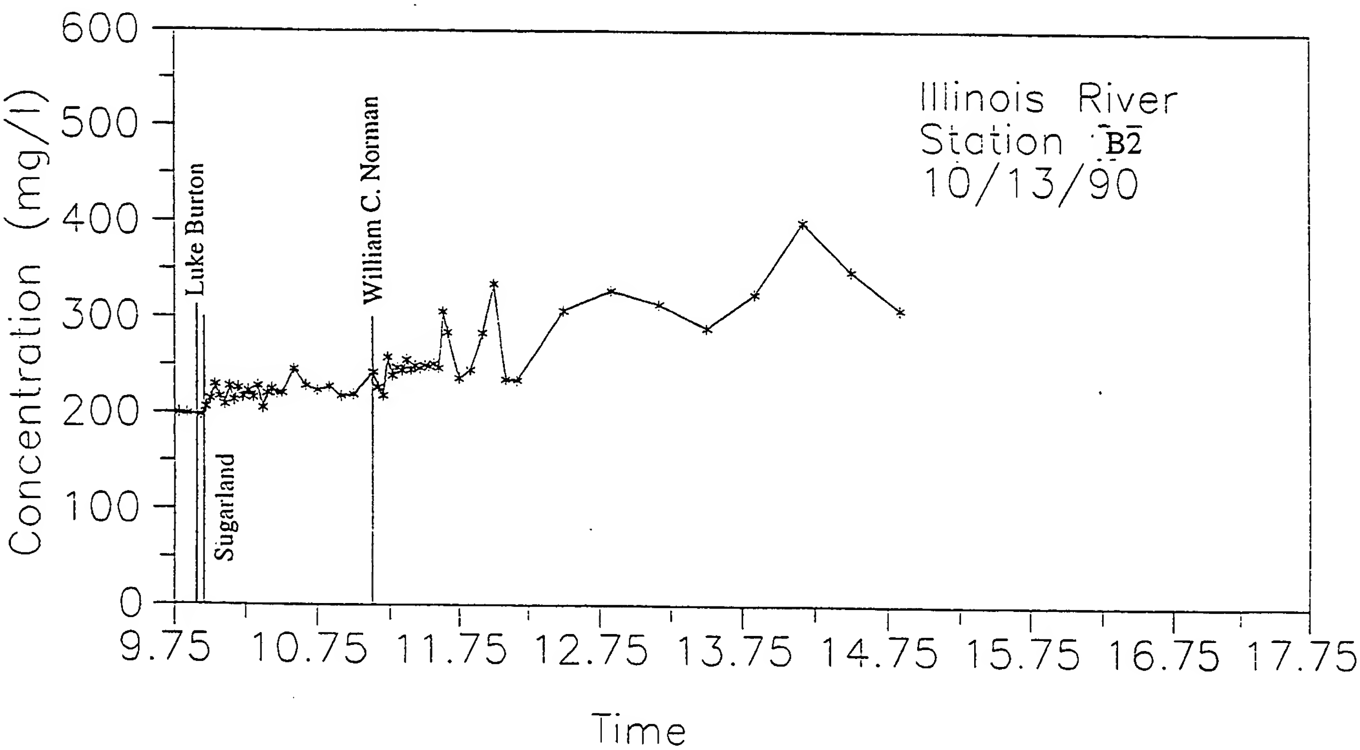
Stations A1 and A2   October 13, 1990



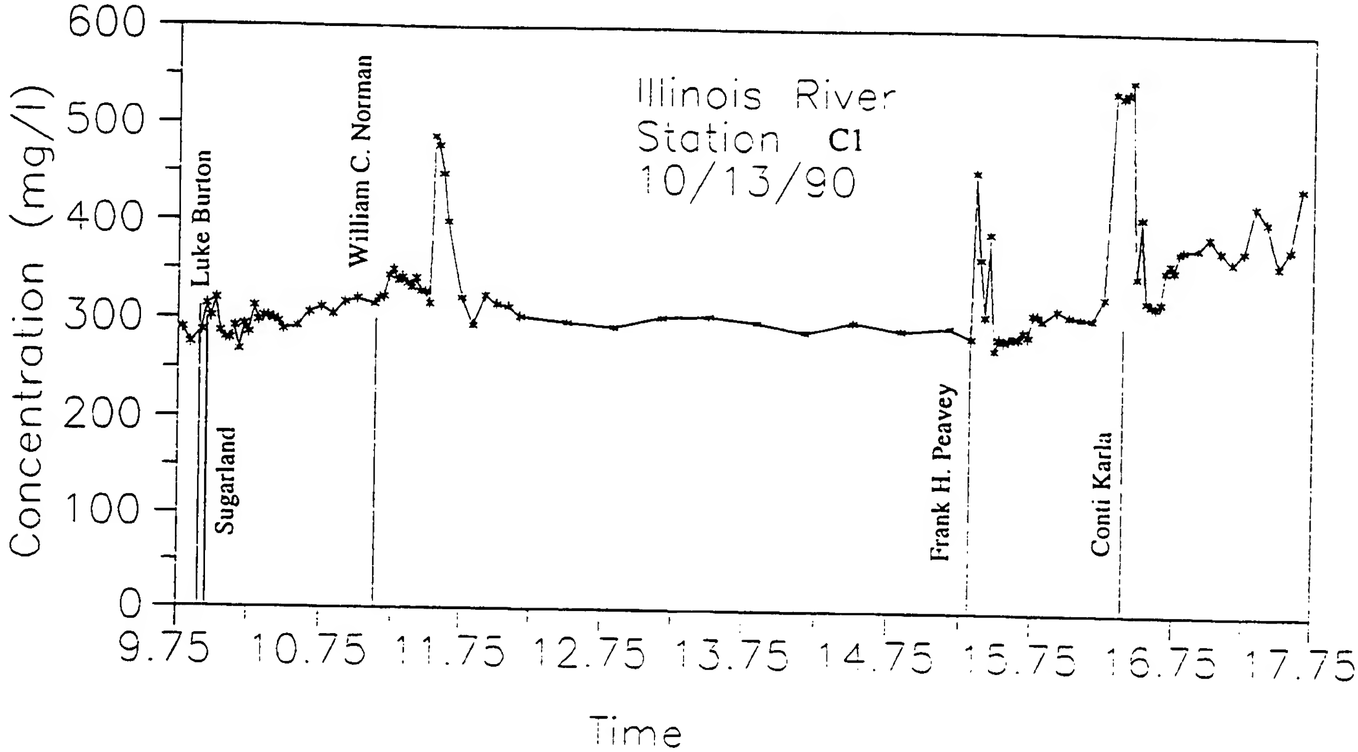


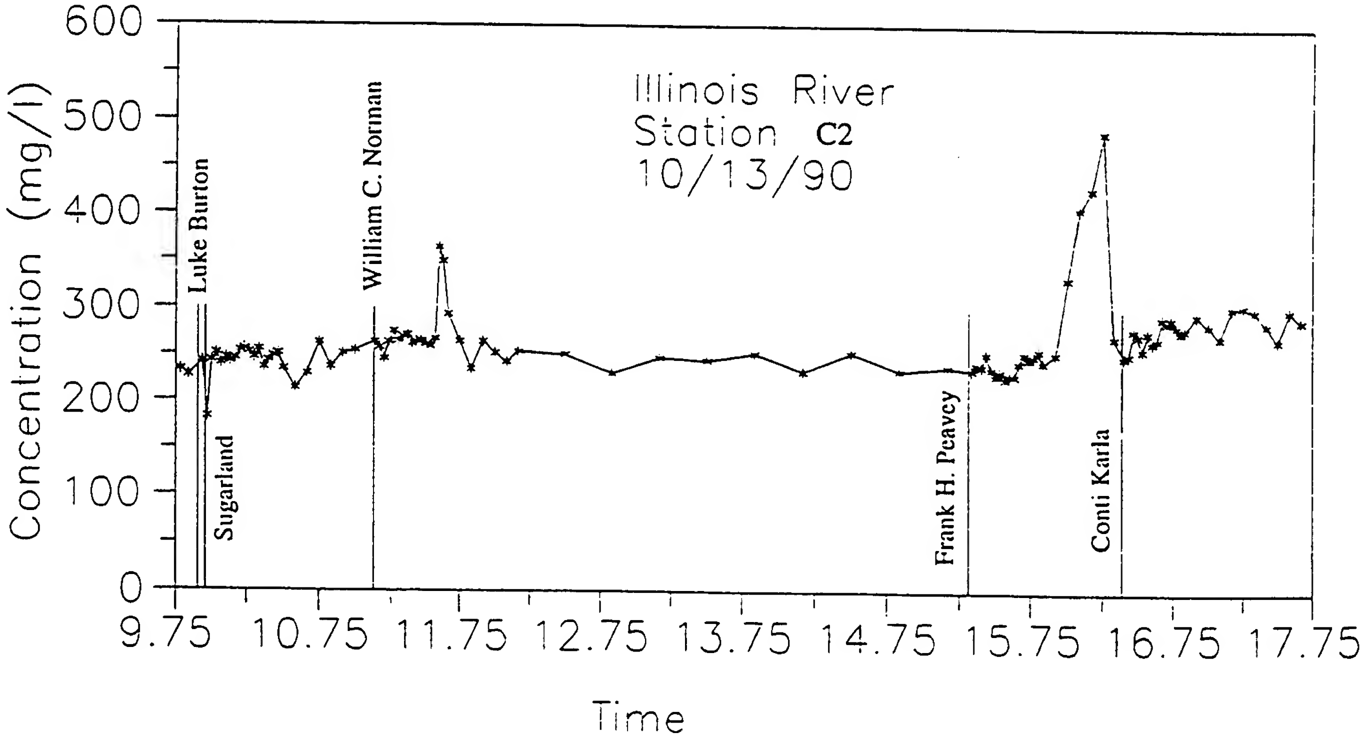
Stations B1 and B2 October 13, 1990



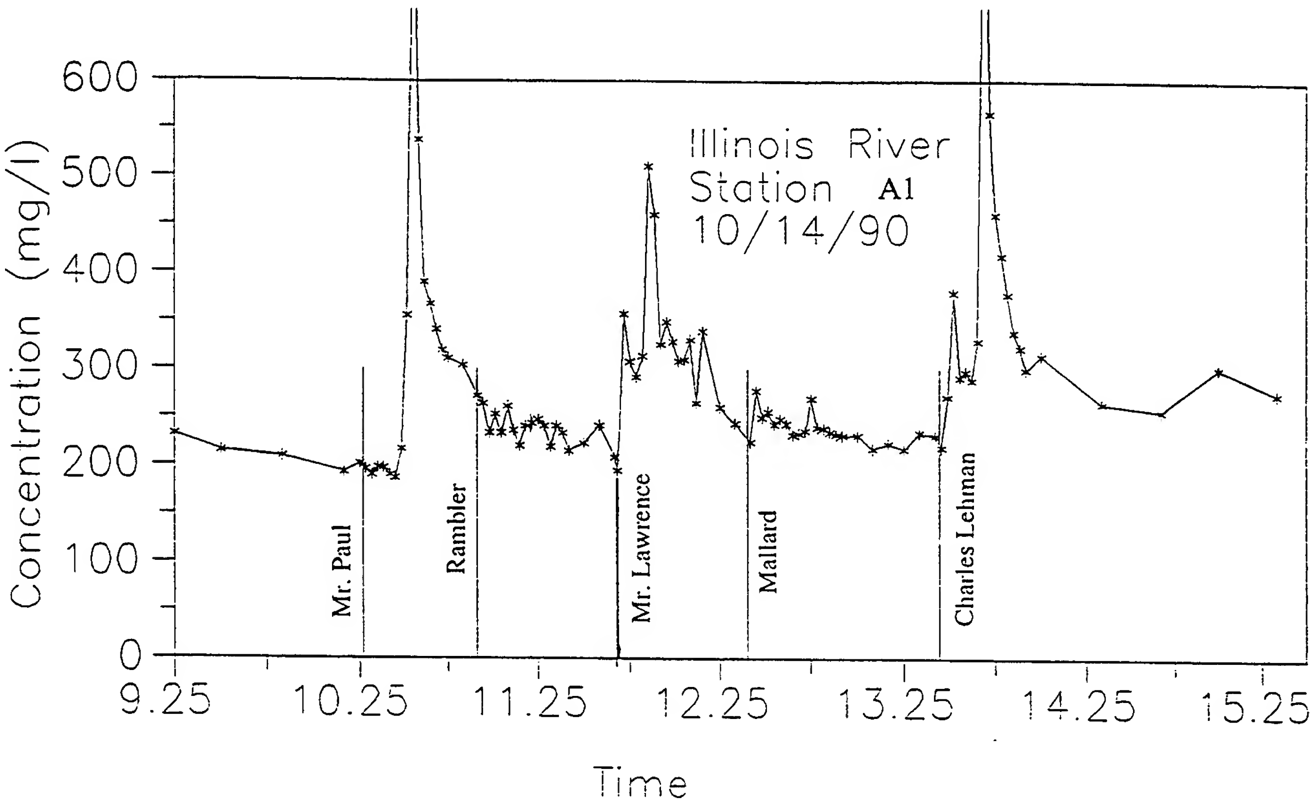


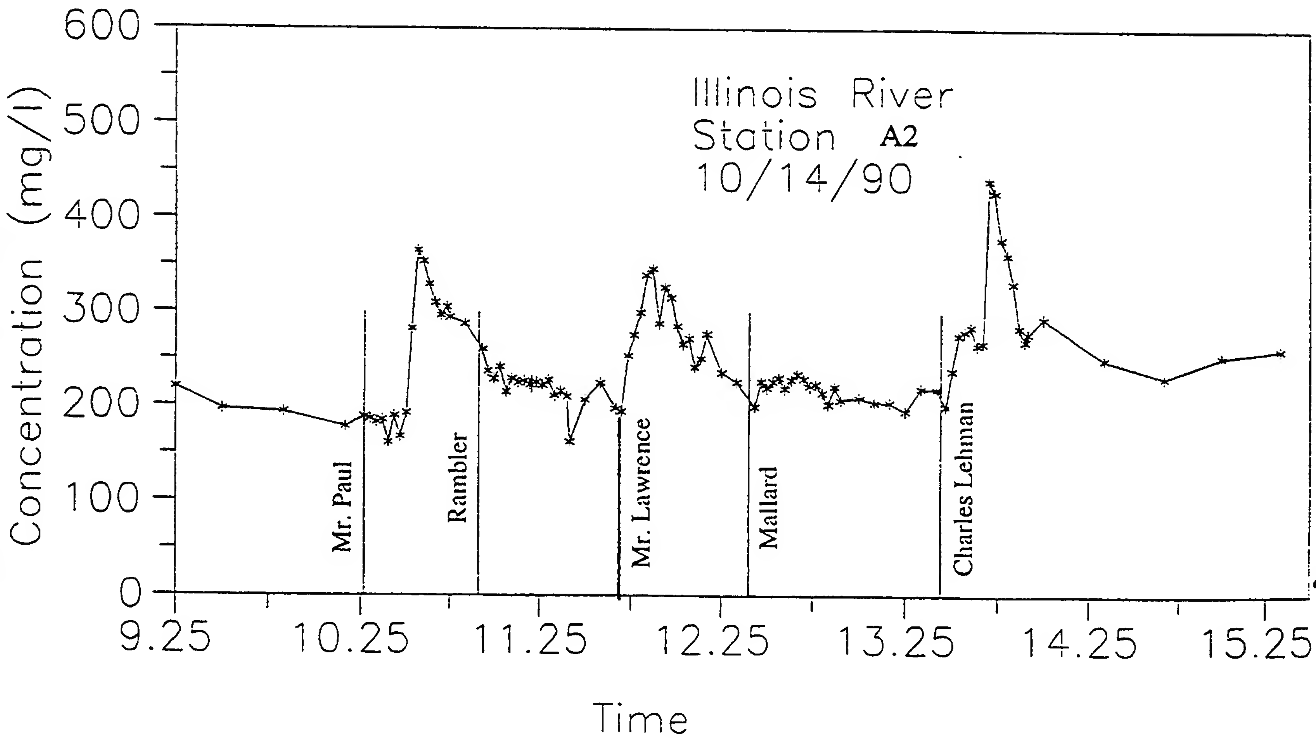
Stations C1 and C2 October 13, 1990



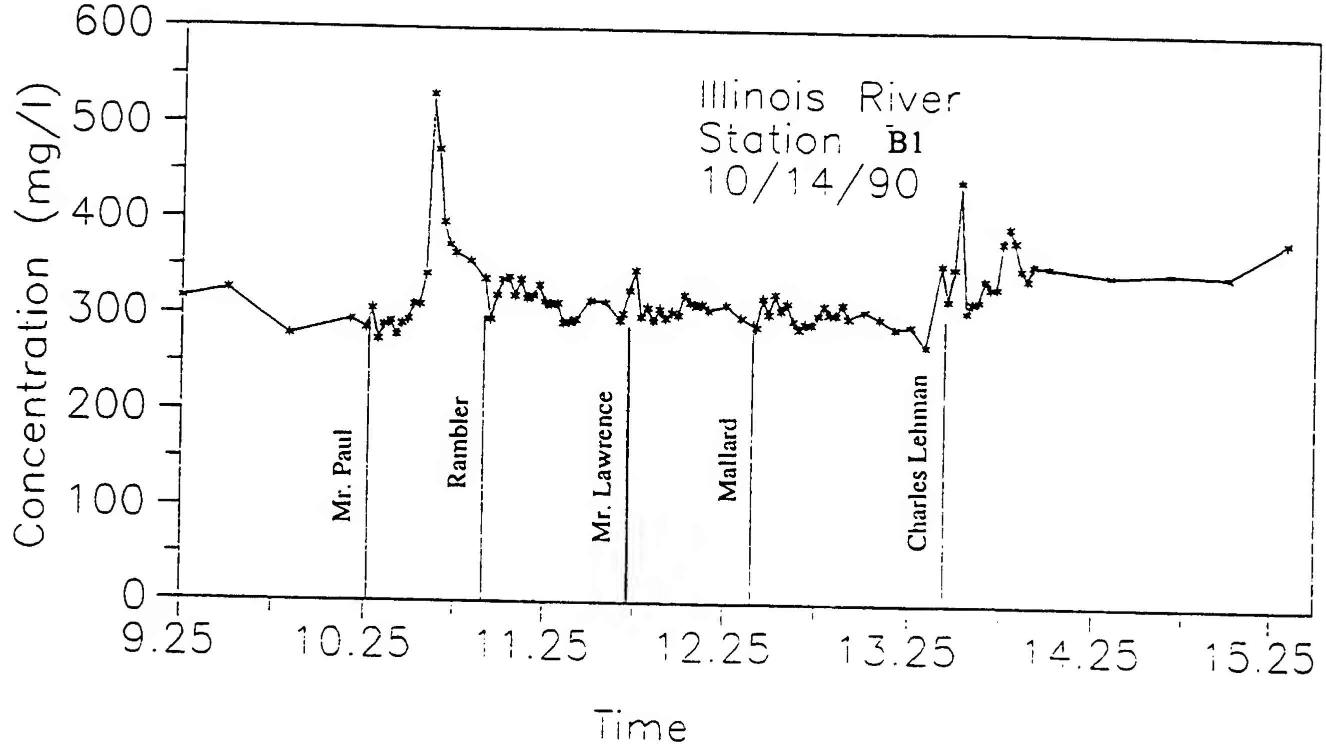


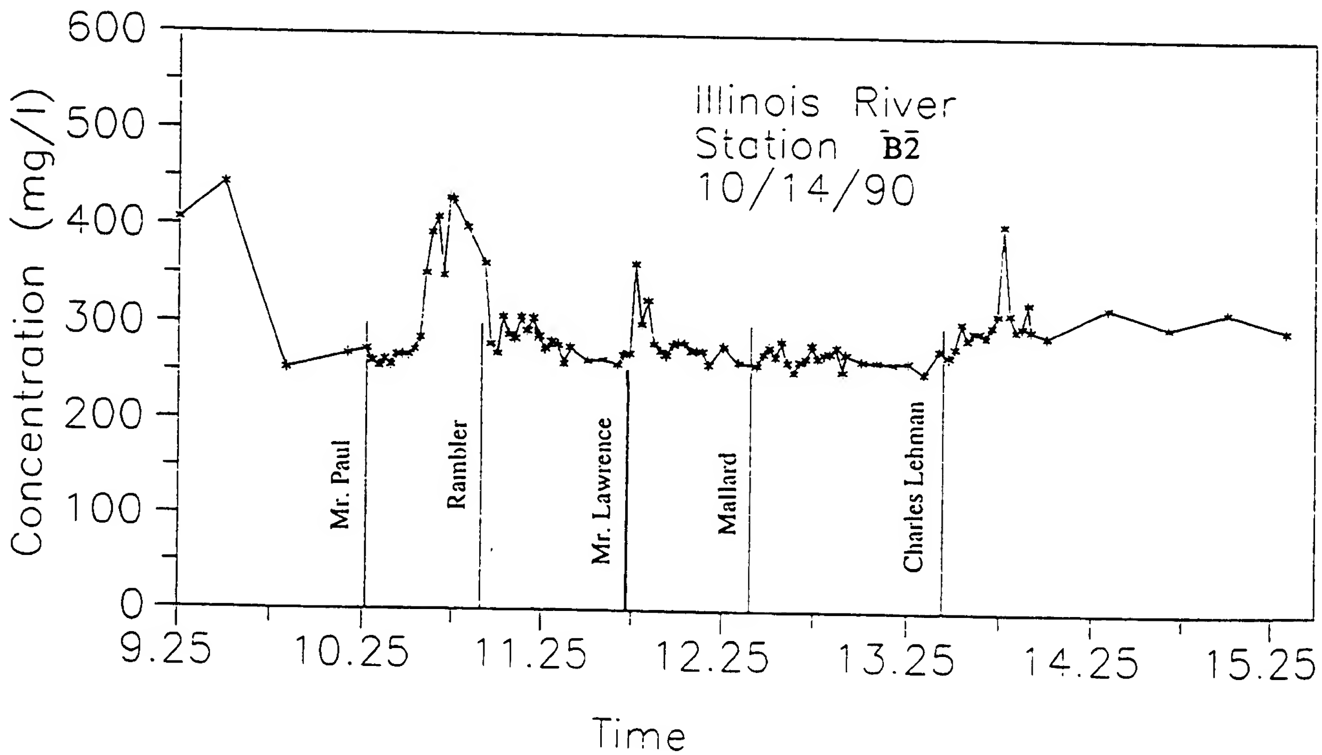
Stations A1 and A2 October 14, 1990



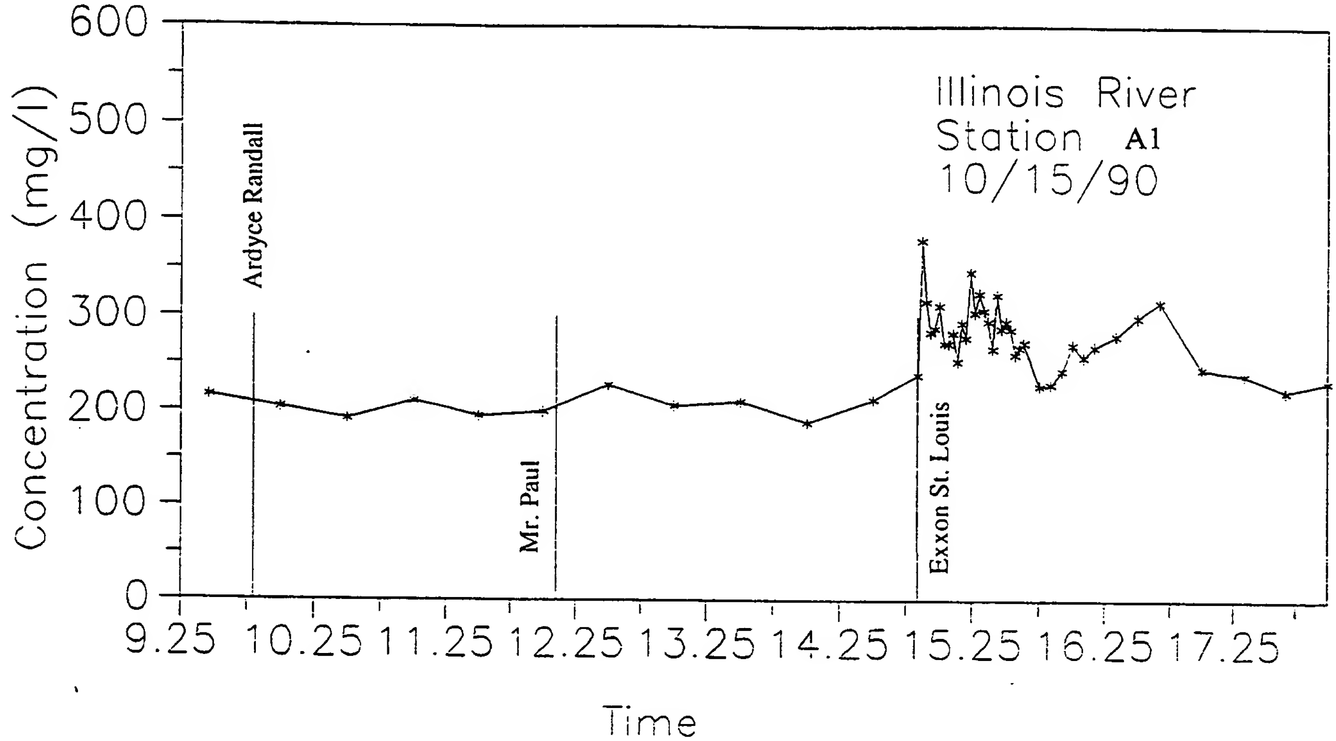


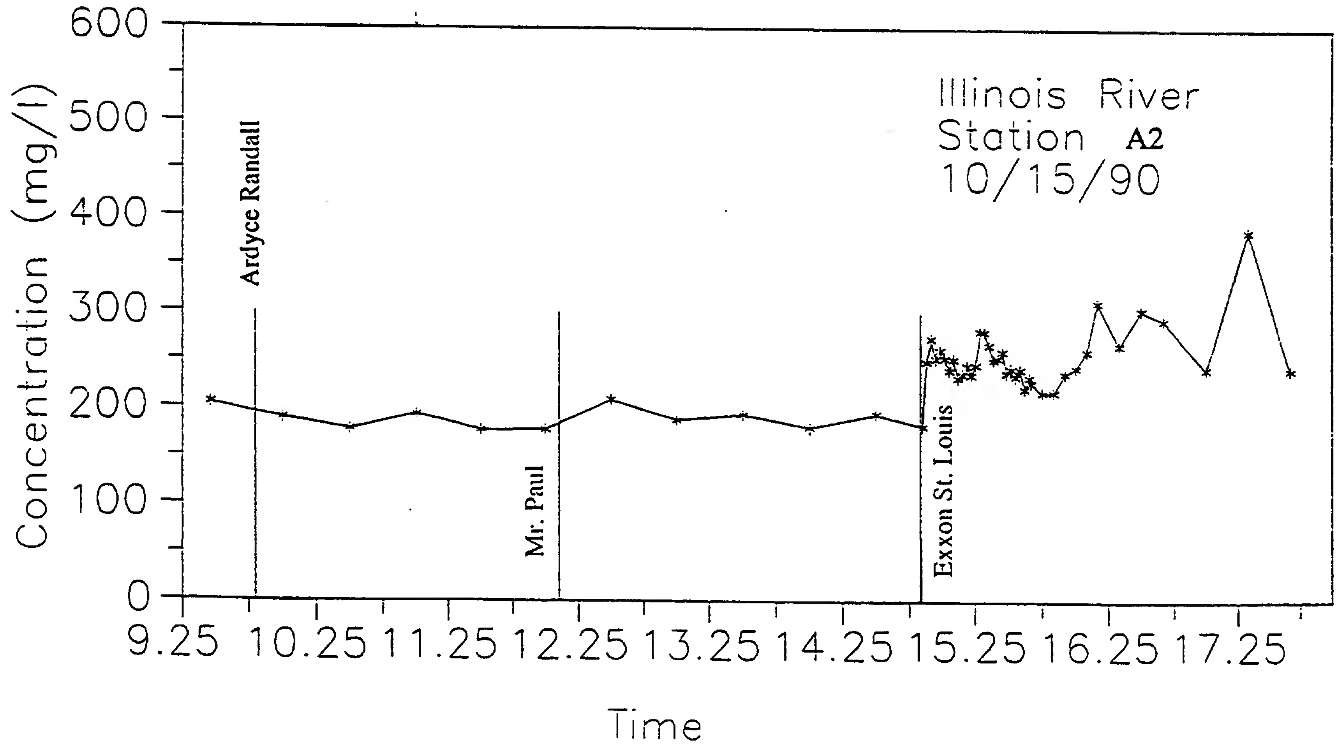
Stations B1 and B2 October 14, 1990



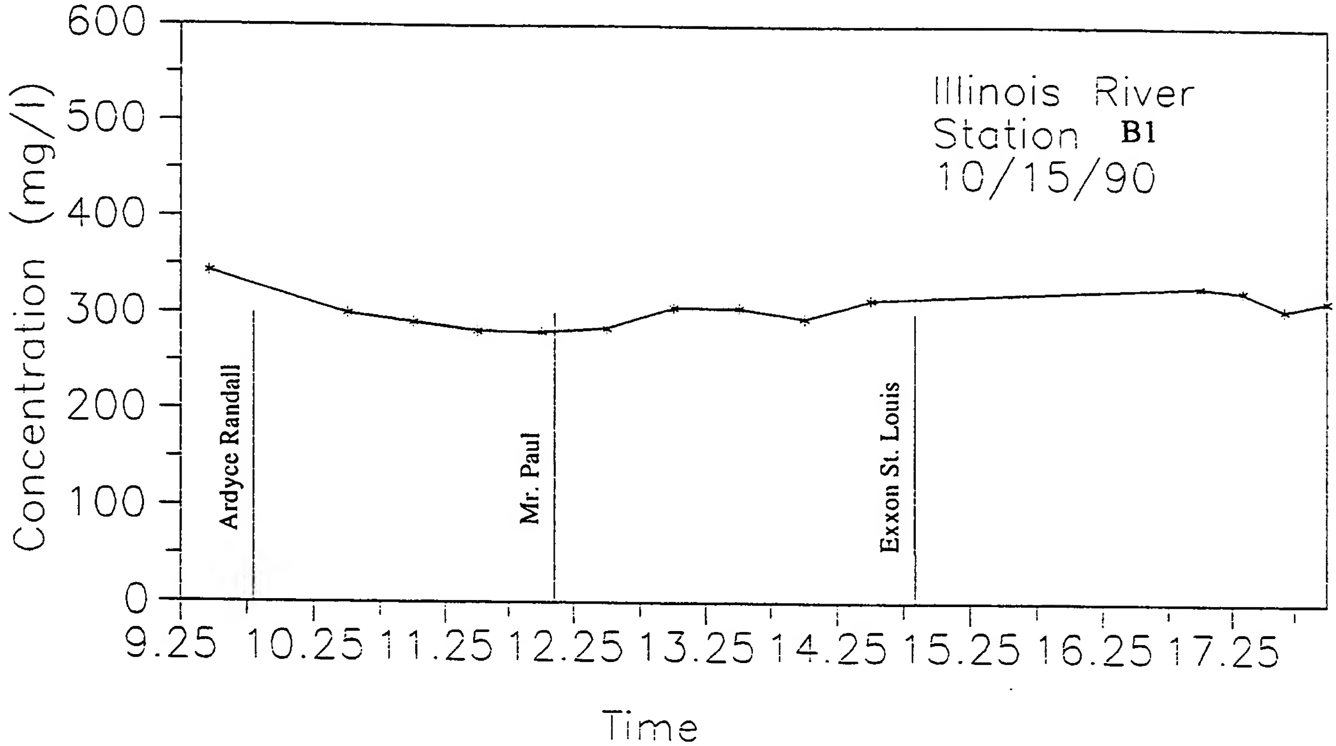


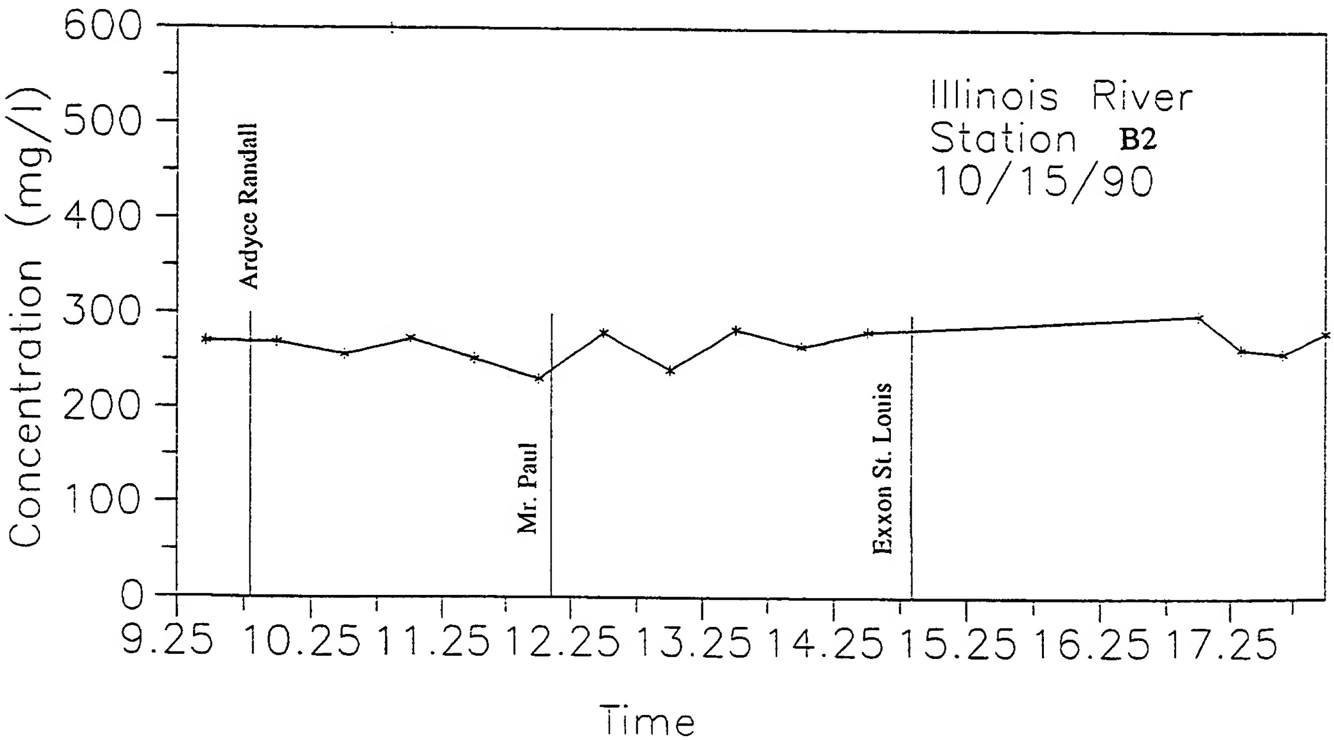
Stations A1 and A2 October 15, 1990



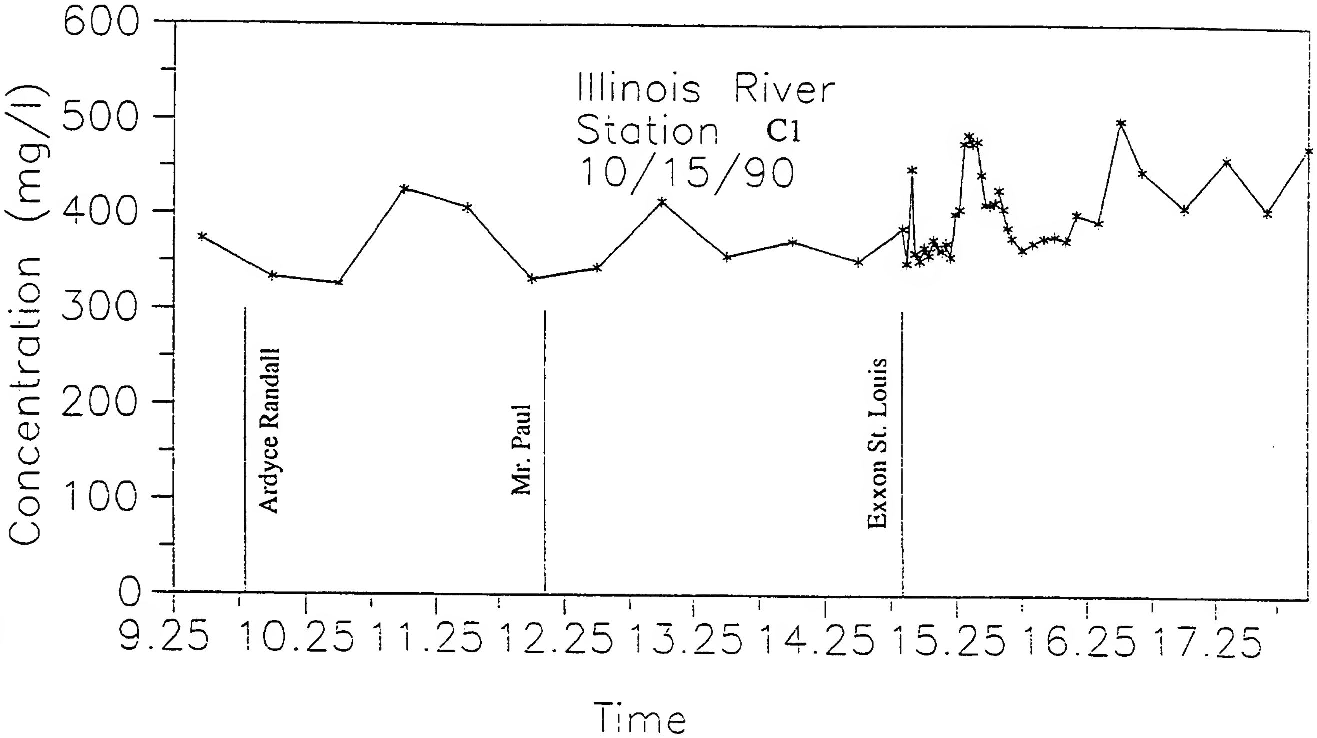


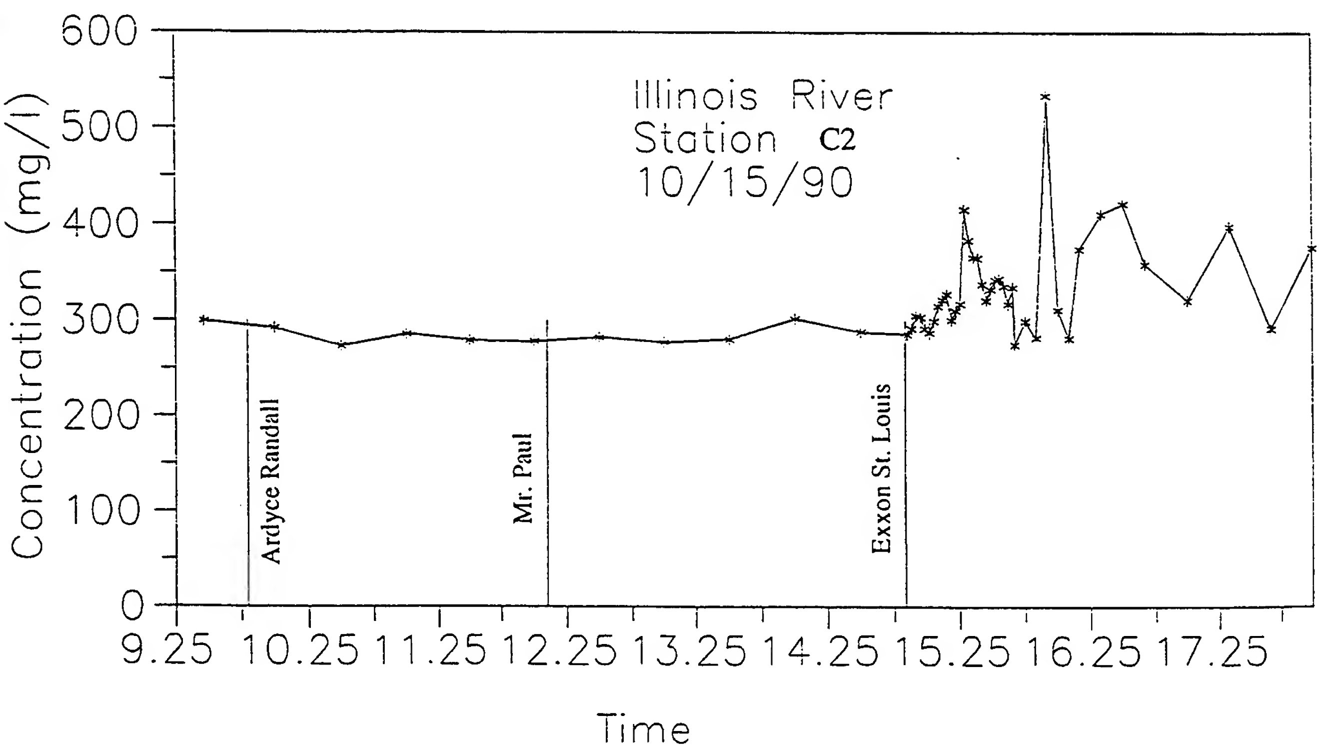
Stations B1 and B2 October 15, 1990



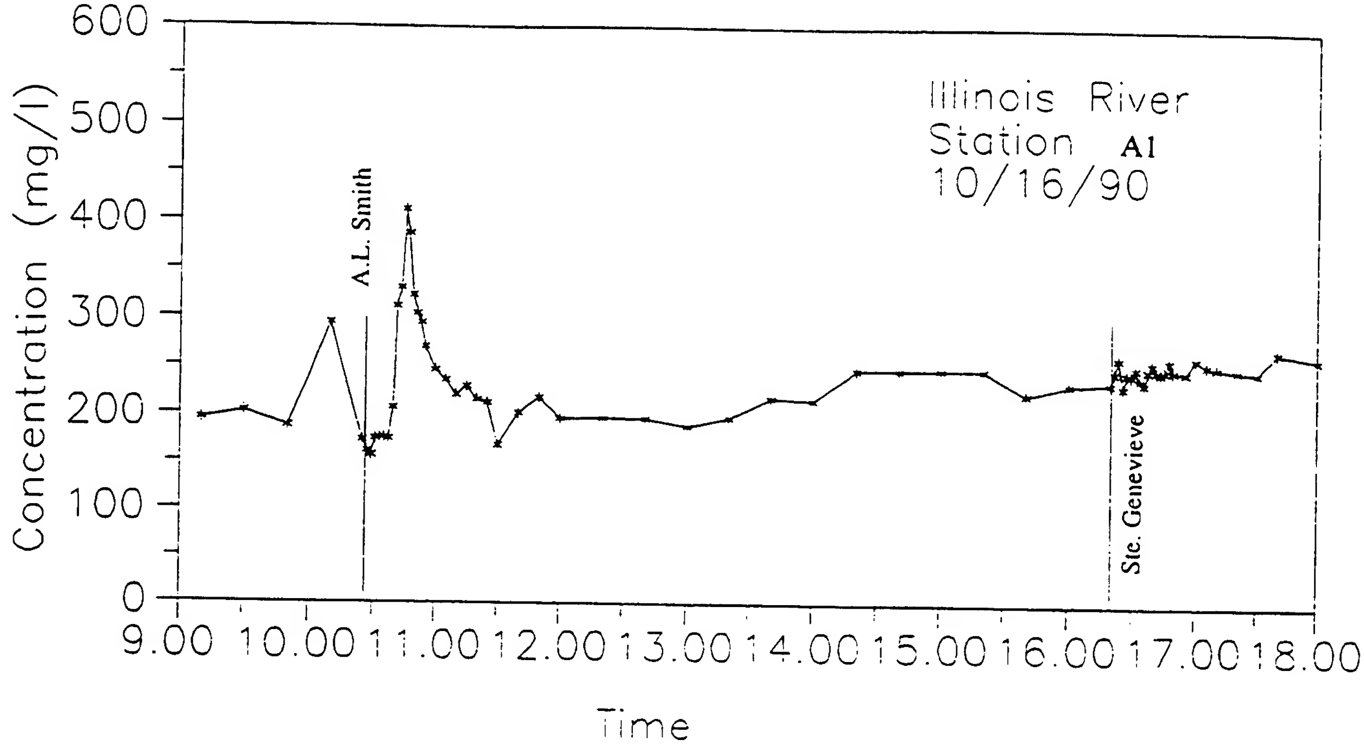


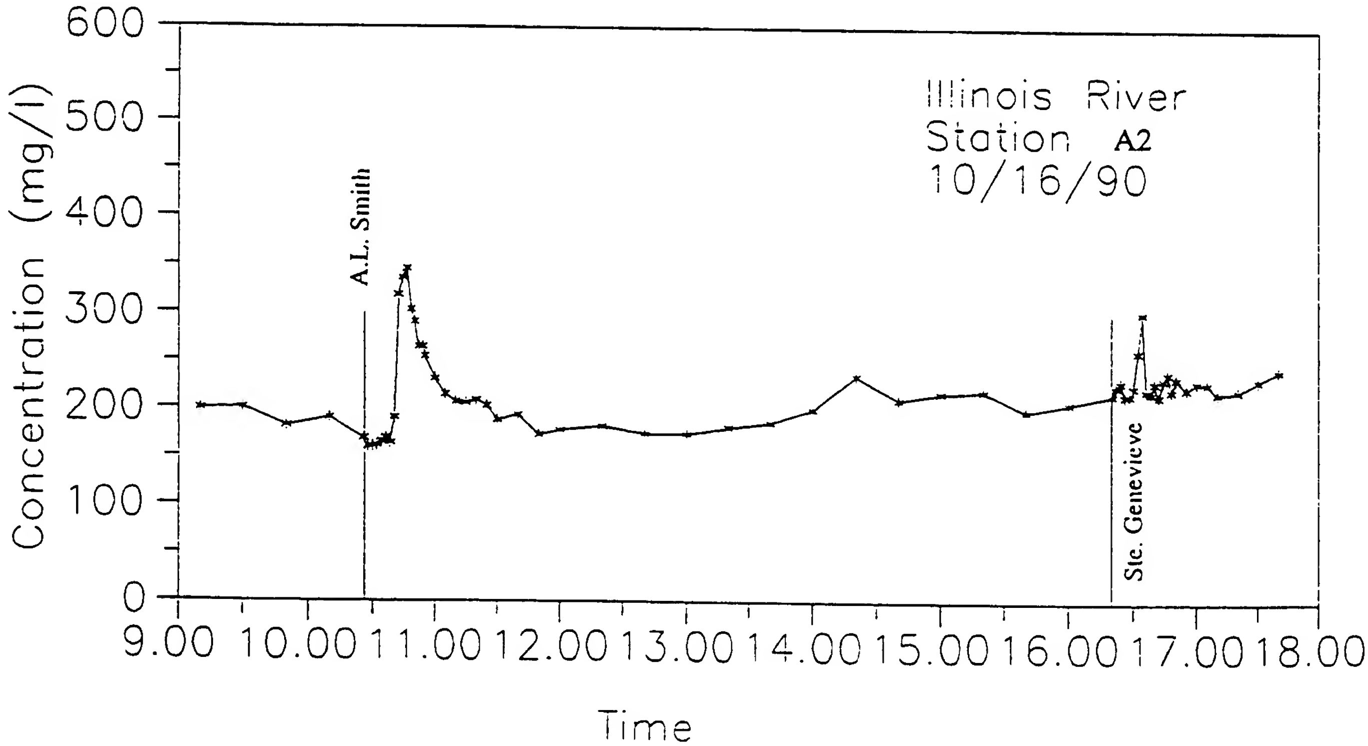
Stations C1 and C2   October 15, 1990



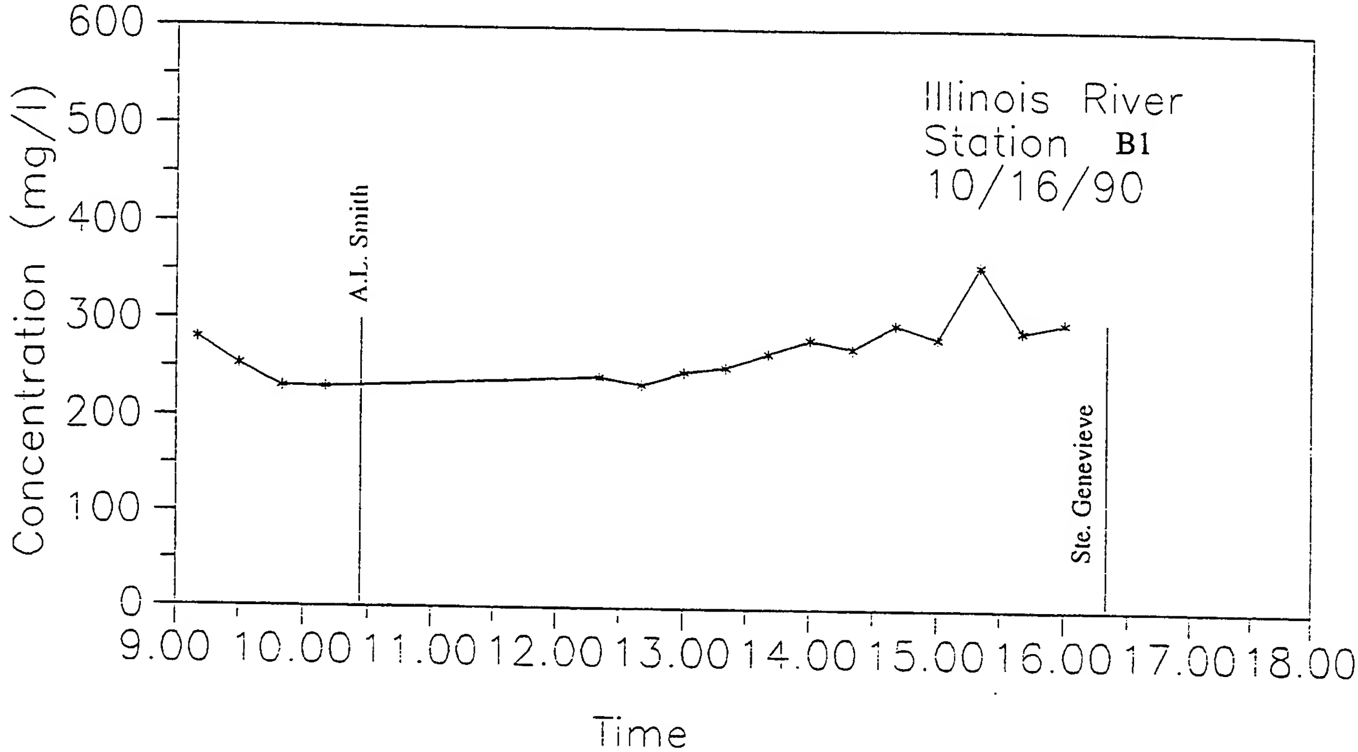


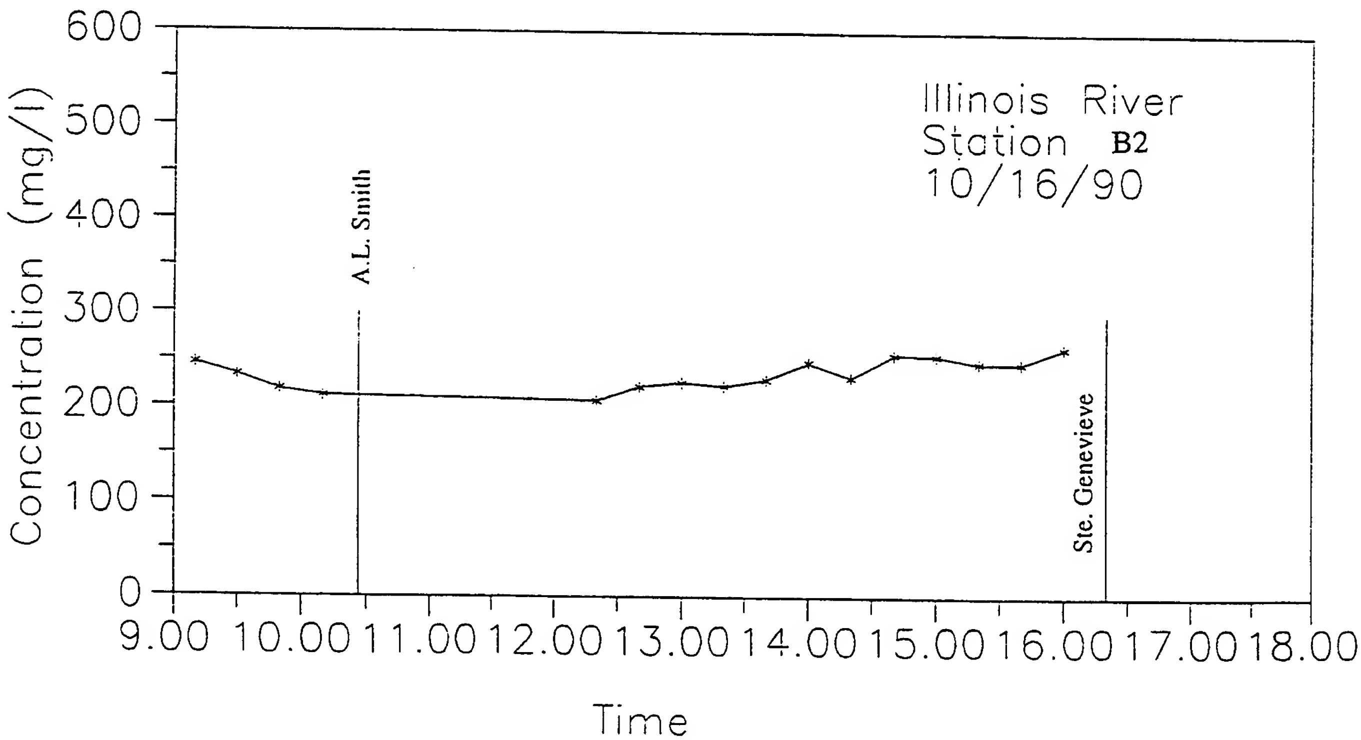
Stations A1 and A2   October 16, 1990



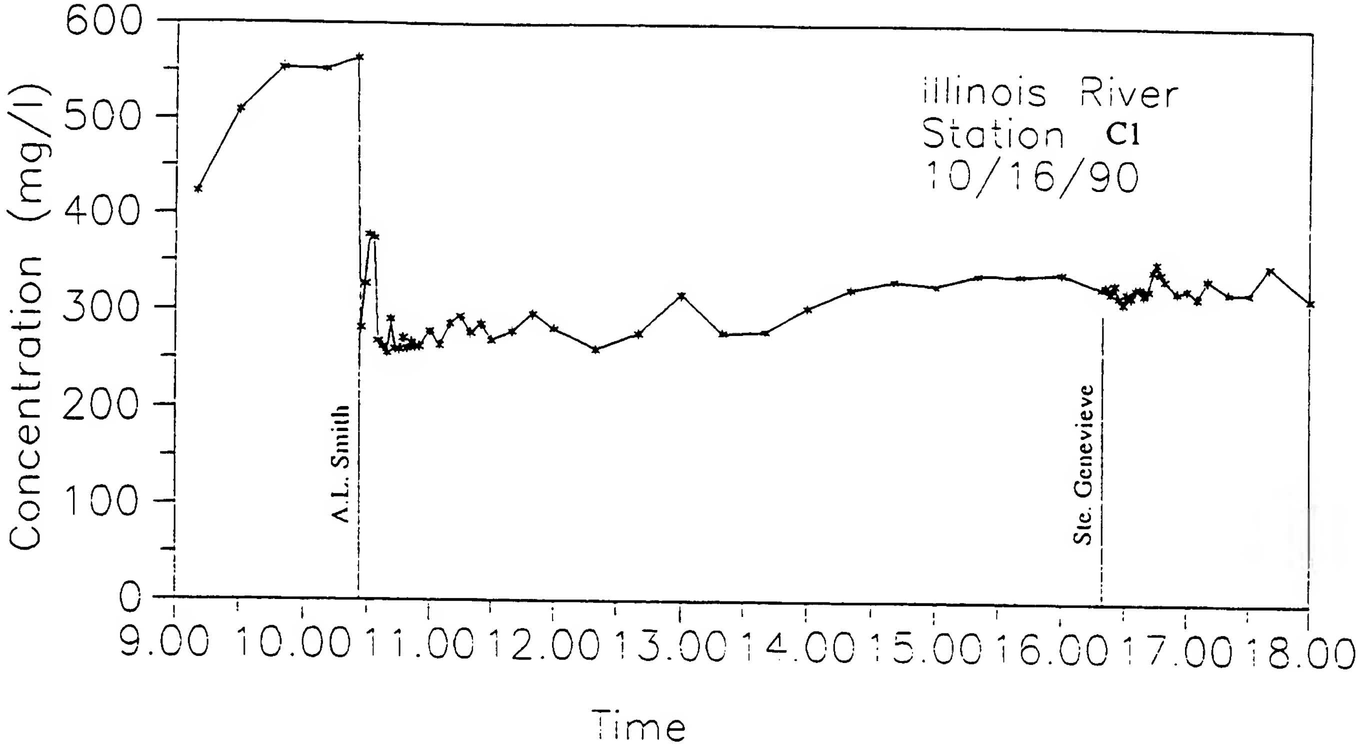


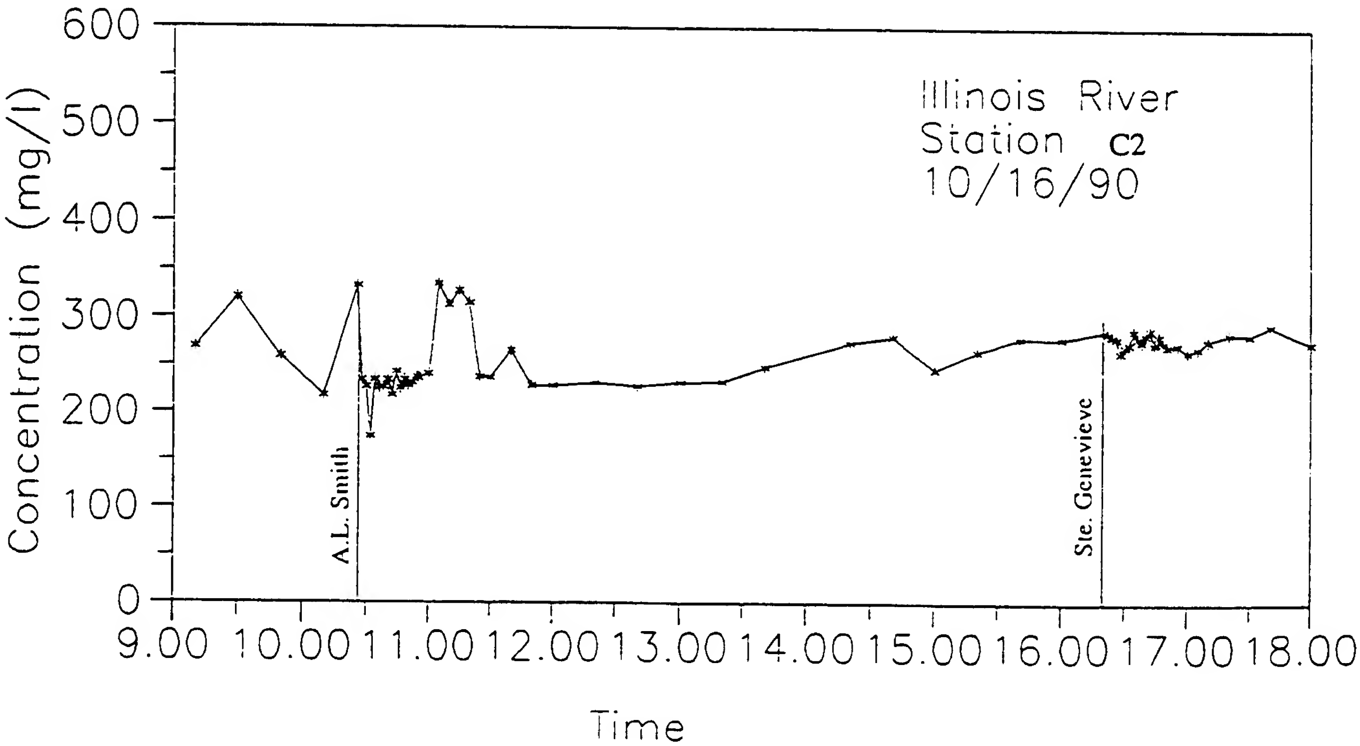
Stations B1 and B2 October 16, 1990



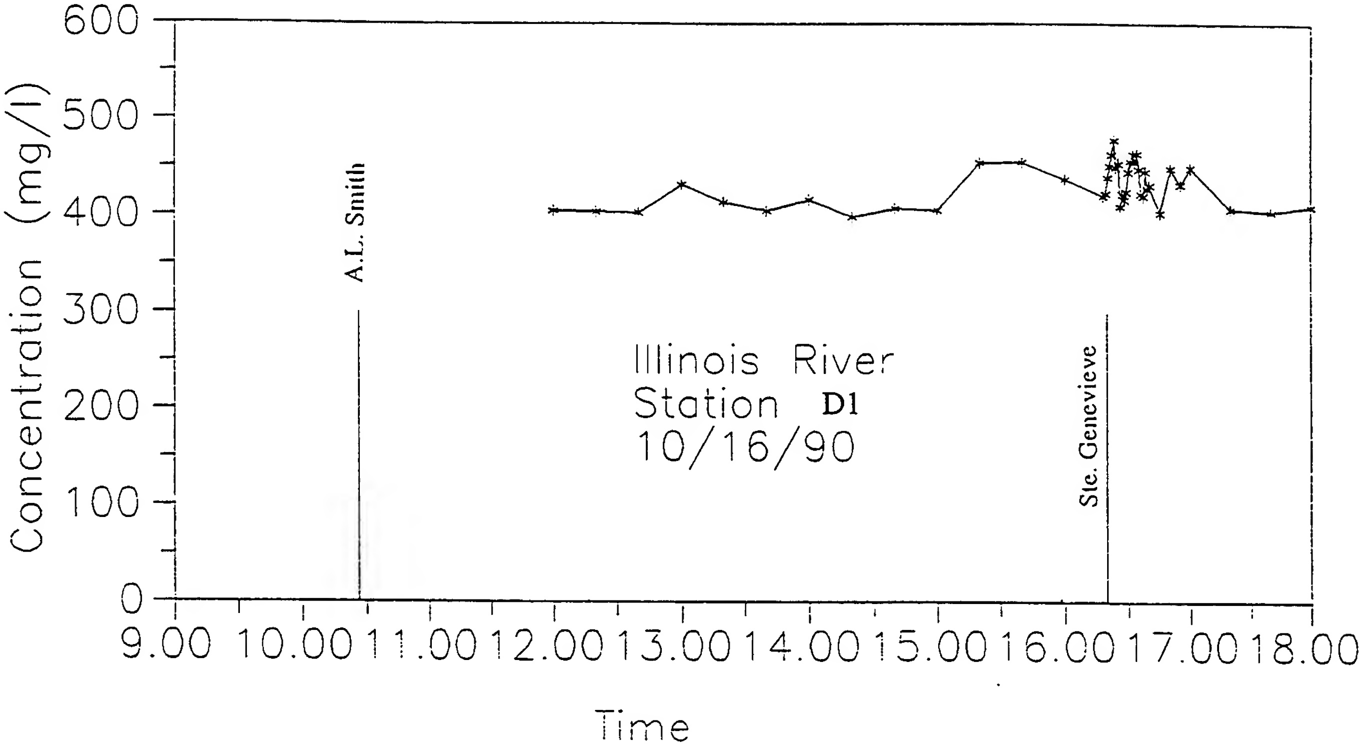


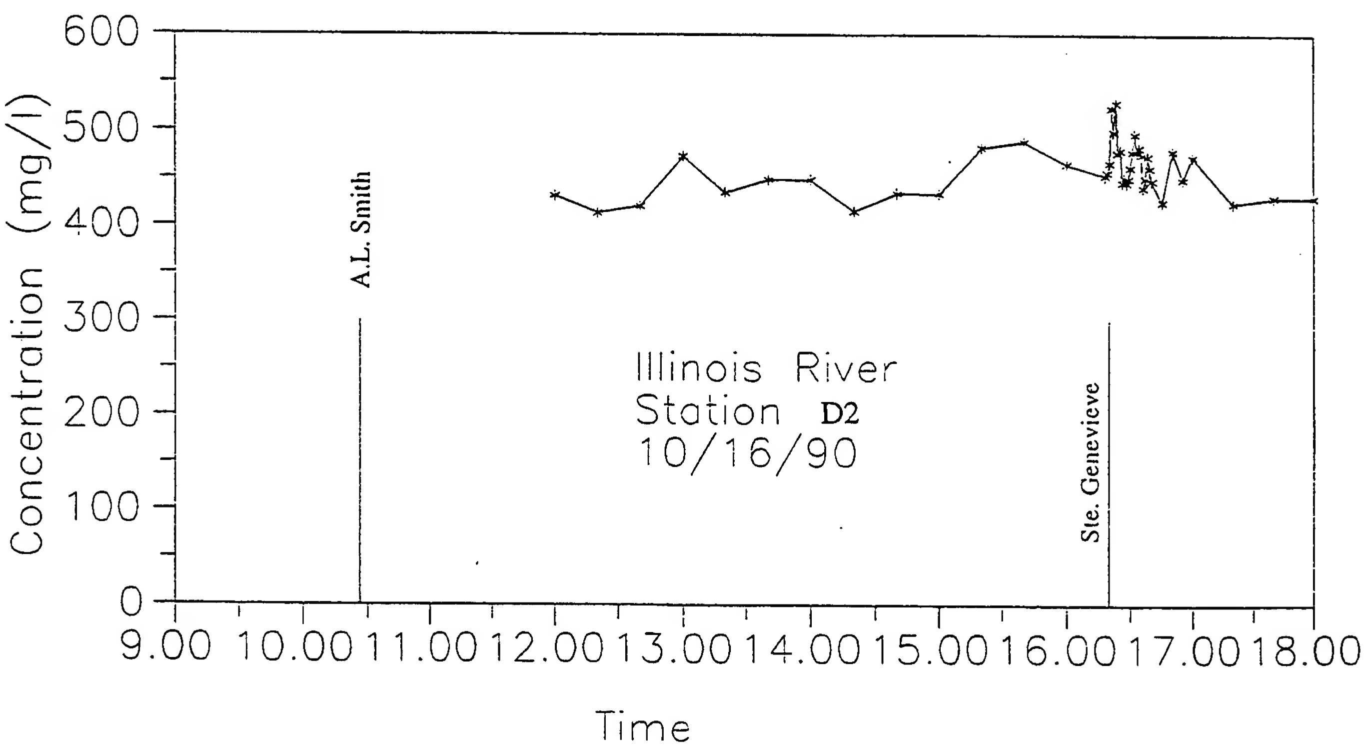
Stations C1 and C2 October 16, 1990



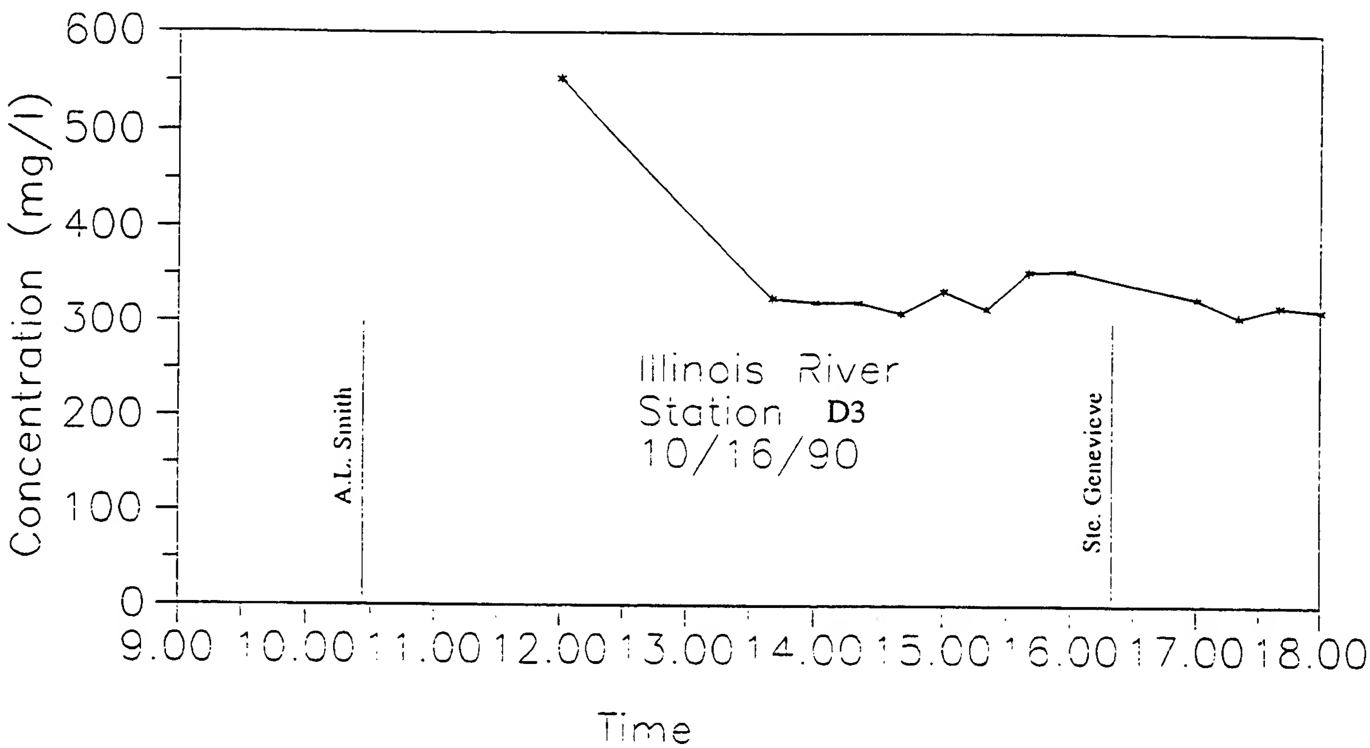


Stations D1 and D2 October 16, 1990

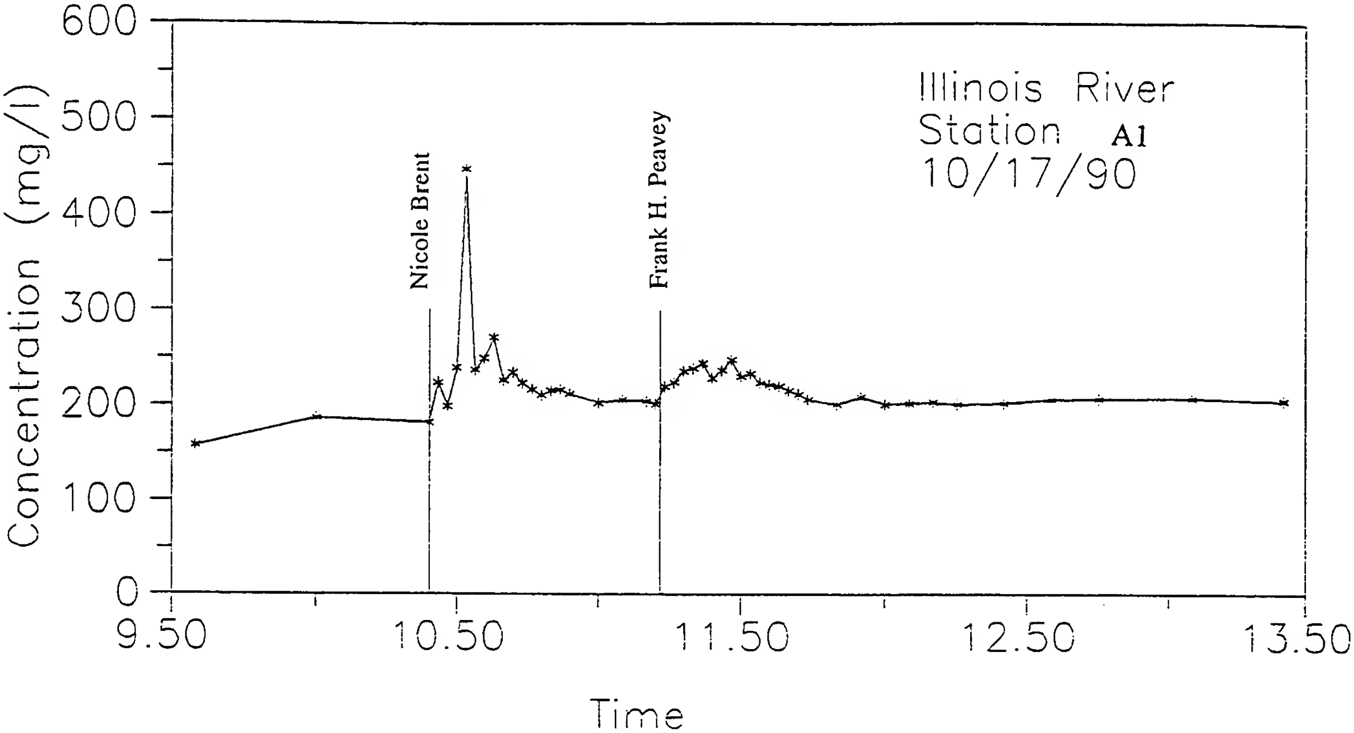


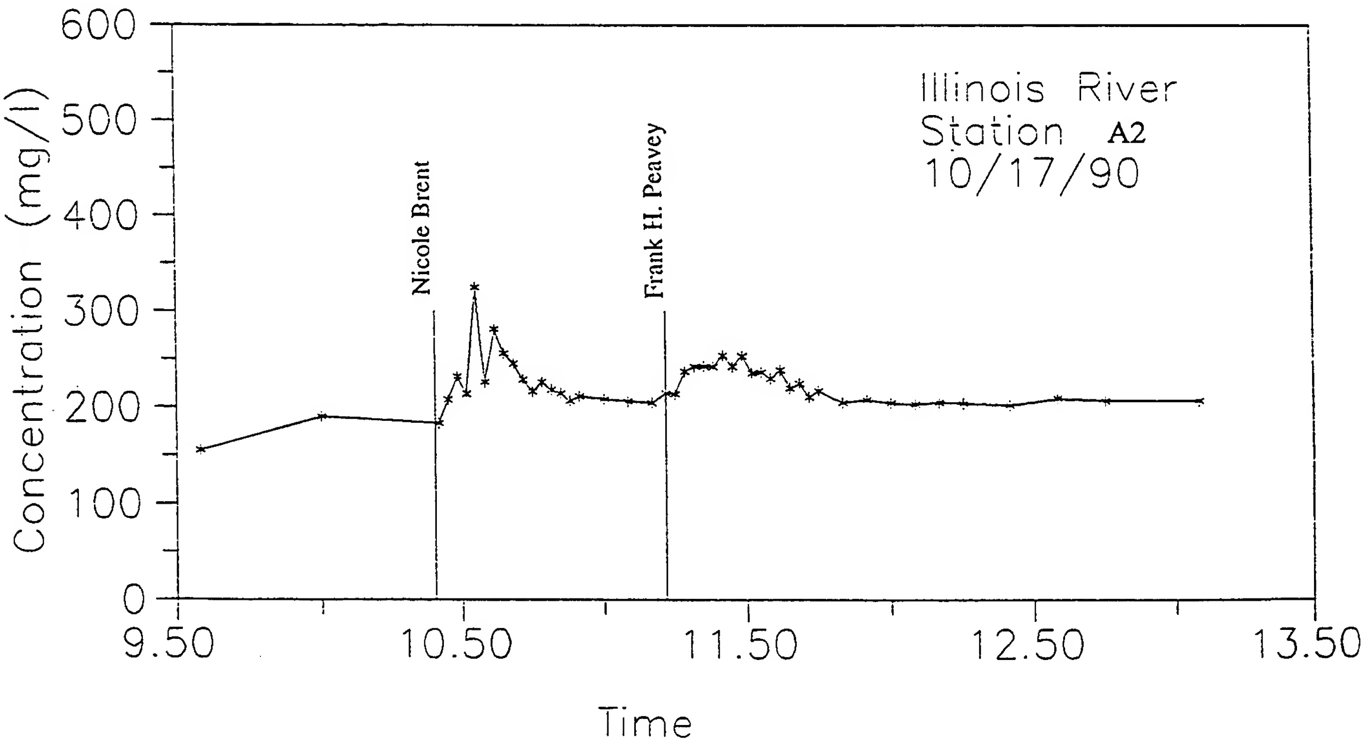


Station D3 October 16, 1990

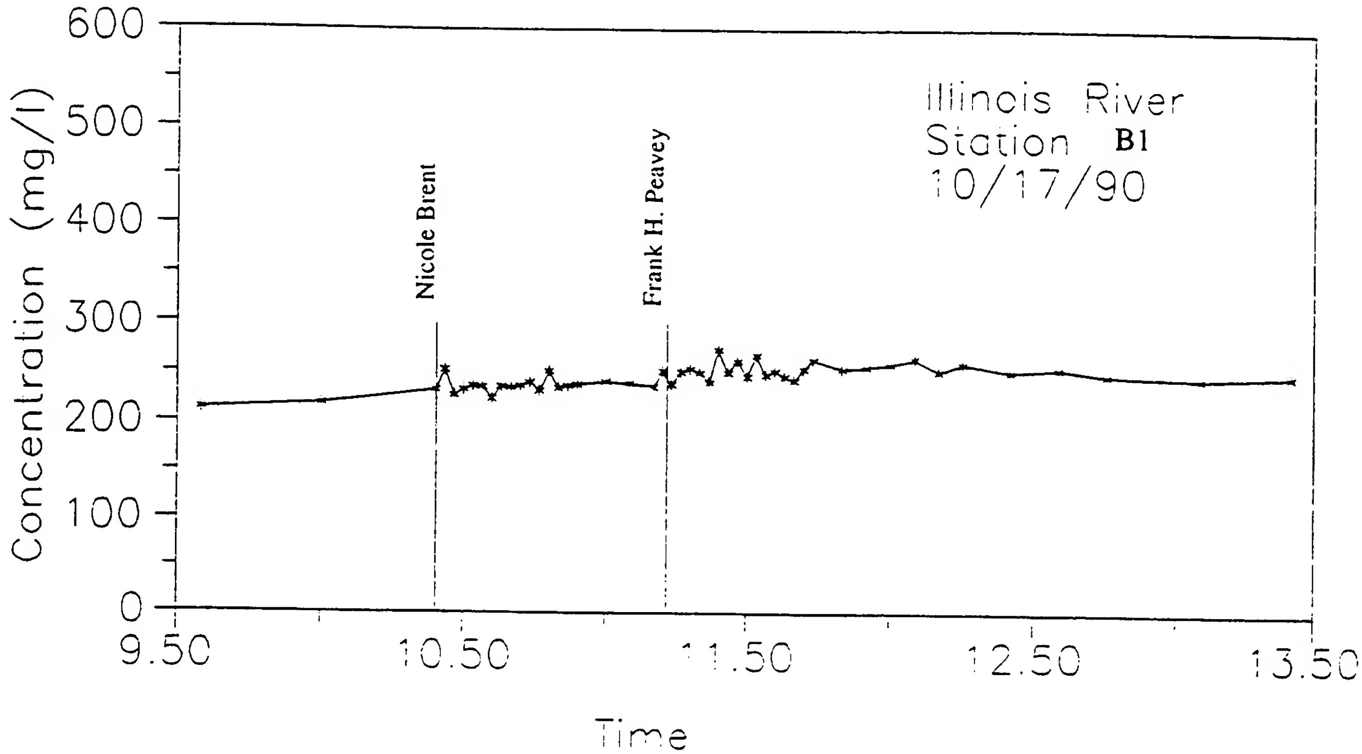


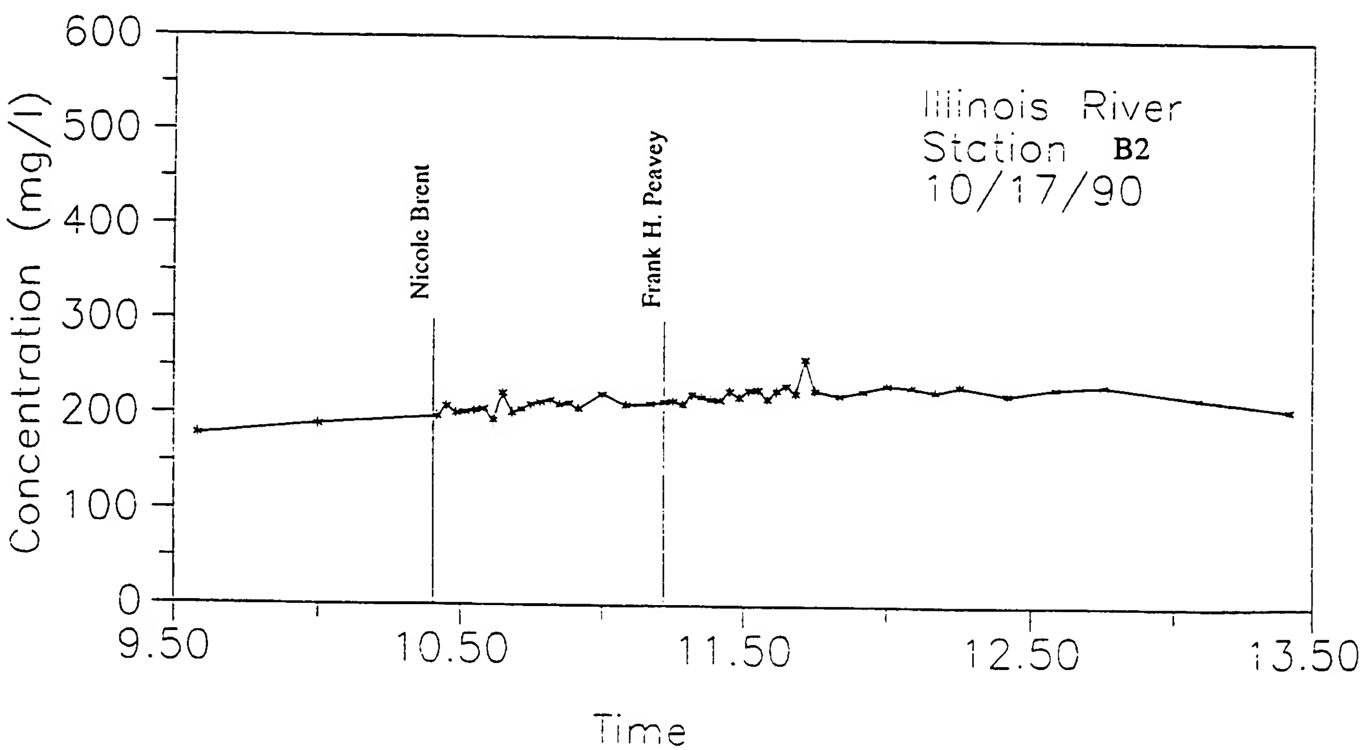
Stations A1 and A2 October 17, 1990





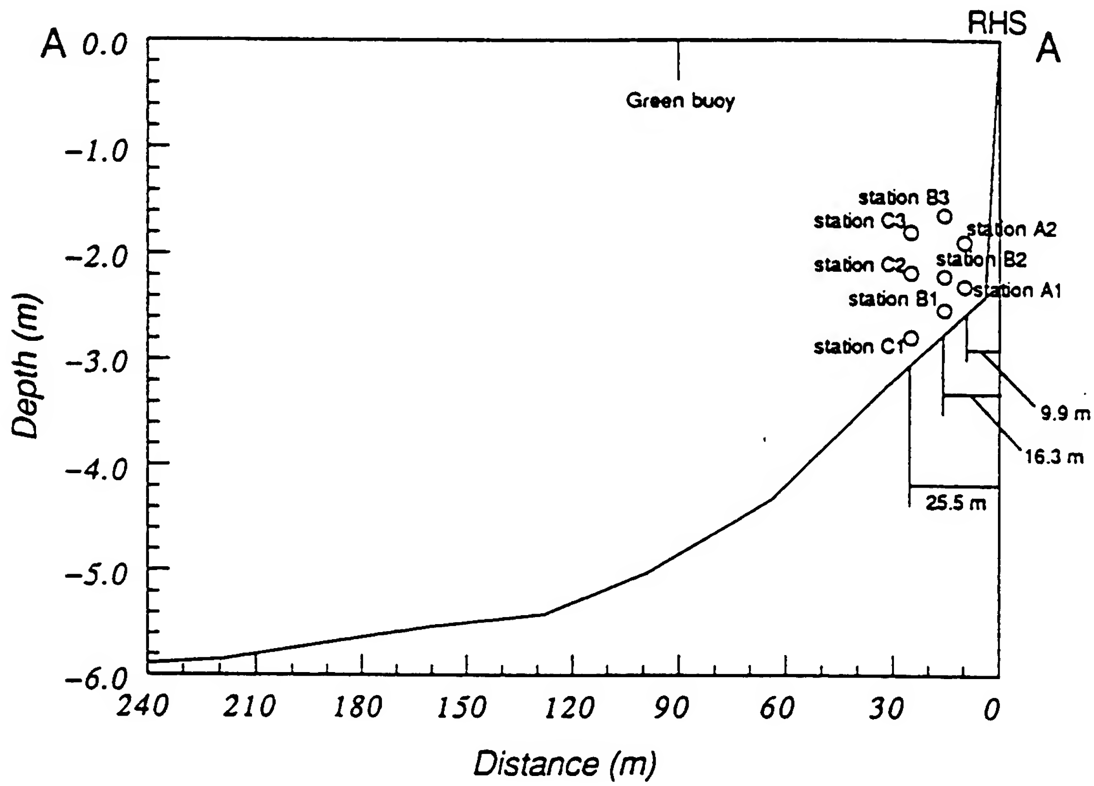
Stations B1 and B2 October 17, 1990



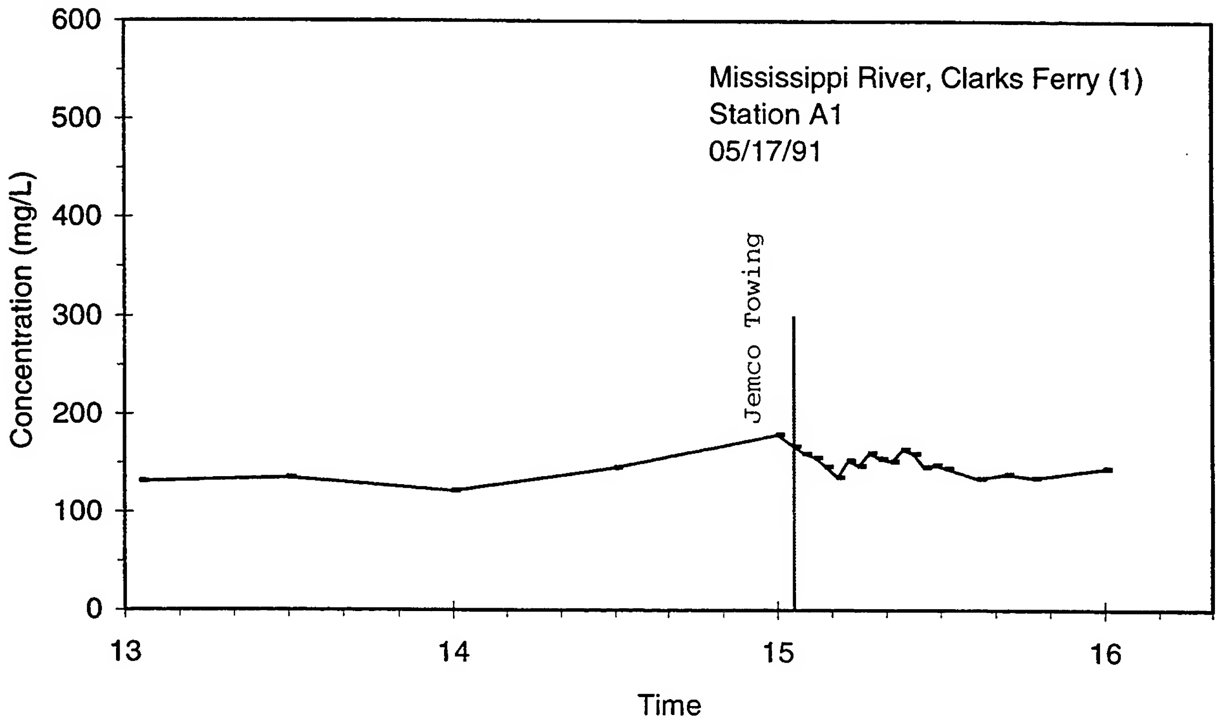


XXV-5. Variation of suspended sediment concentration with time, Clarks Ferry, trip 1

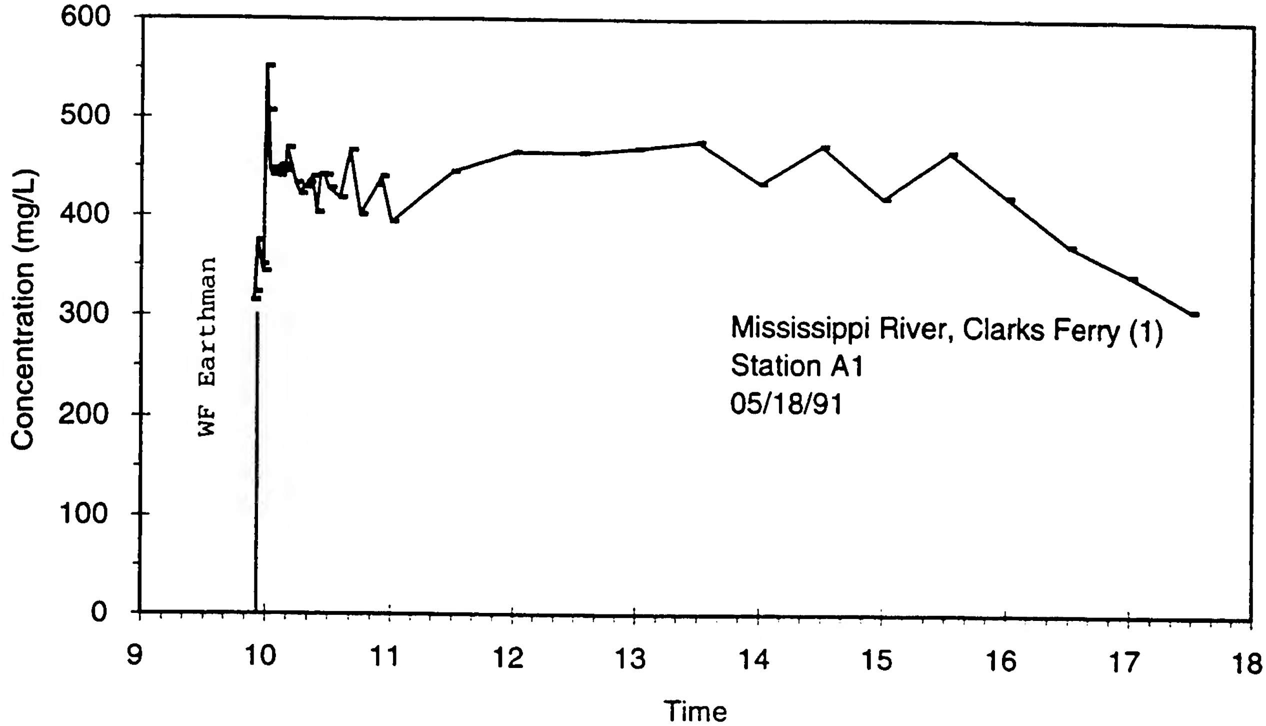
Location of suspended sediment sampling stations on the Mississippi River near the Clarks Ferry site during May 13-23, 1991 (trip 1)

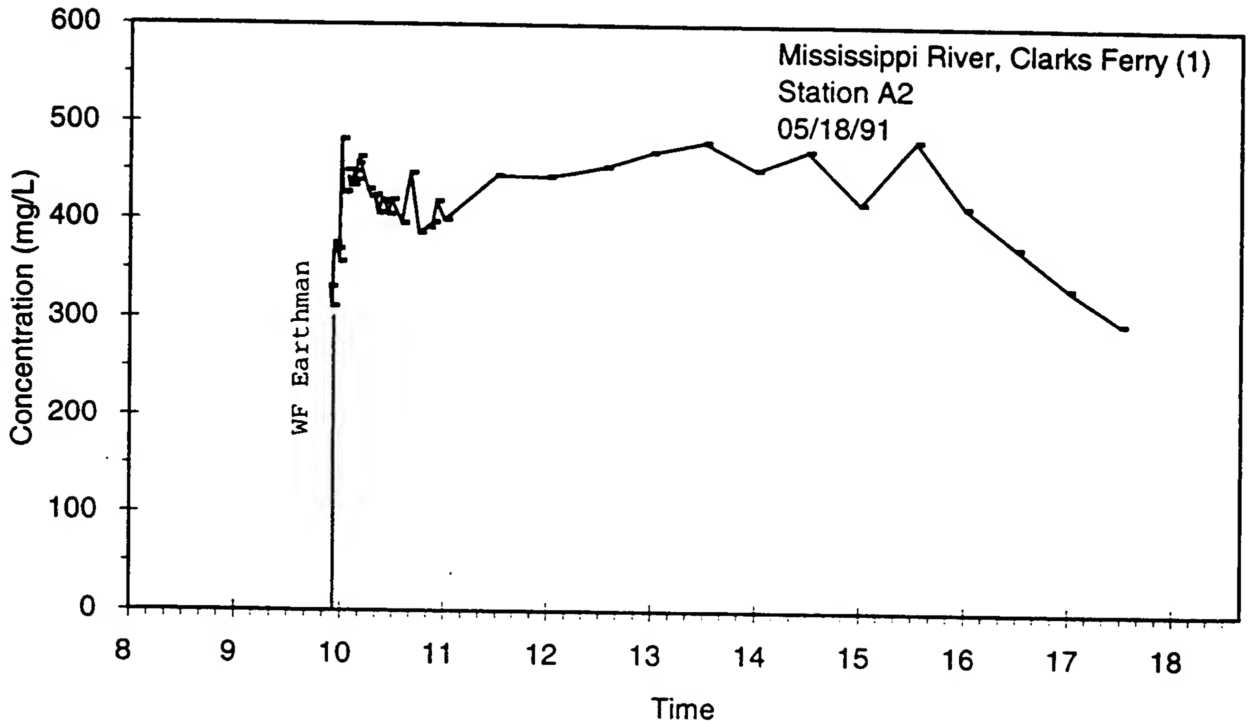


Station A1 May 17, 1991

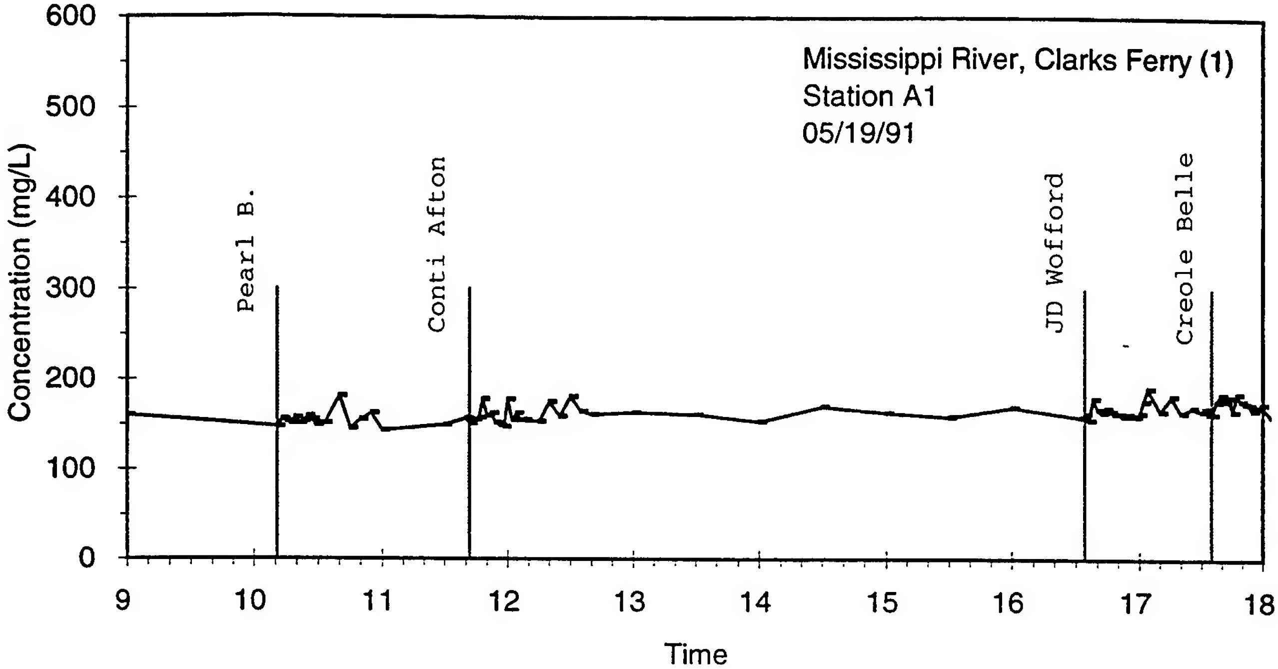


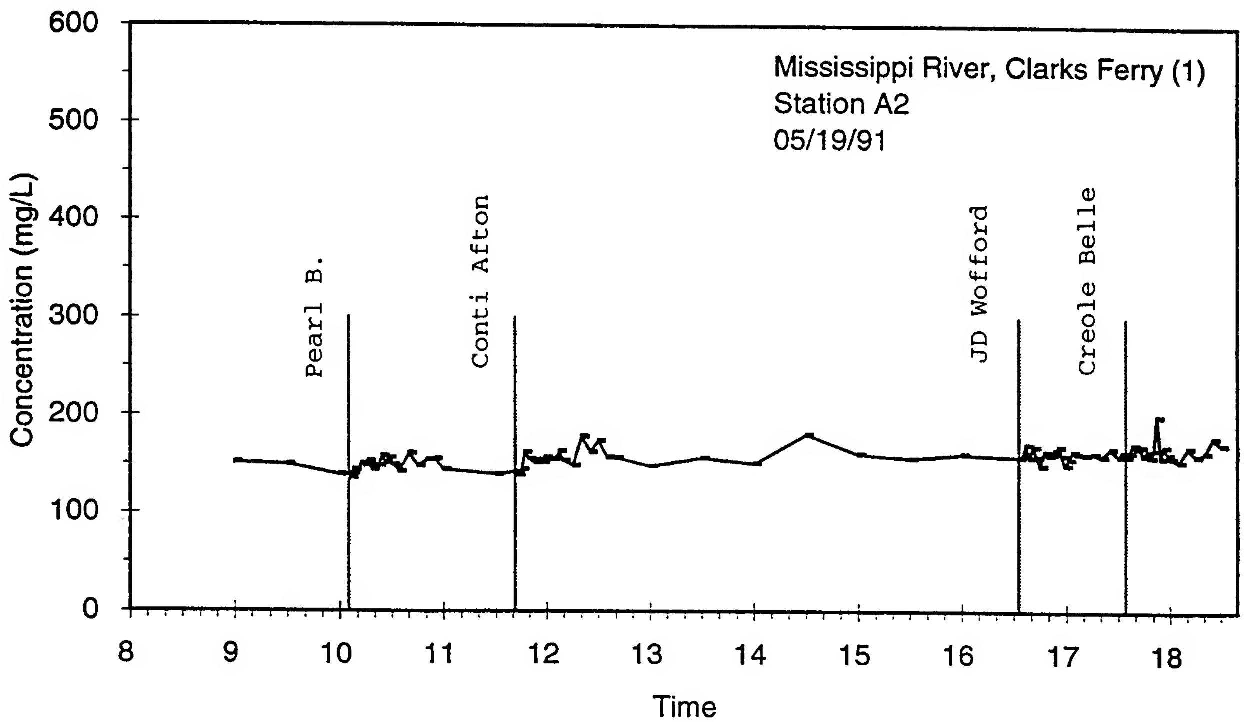
Stations A1 and A2   May 18, 1991





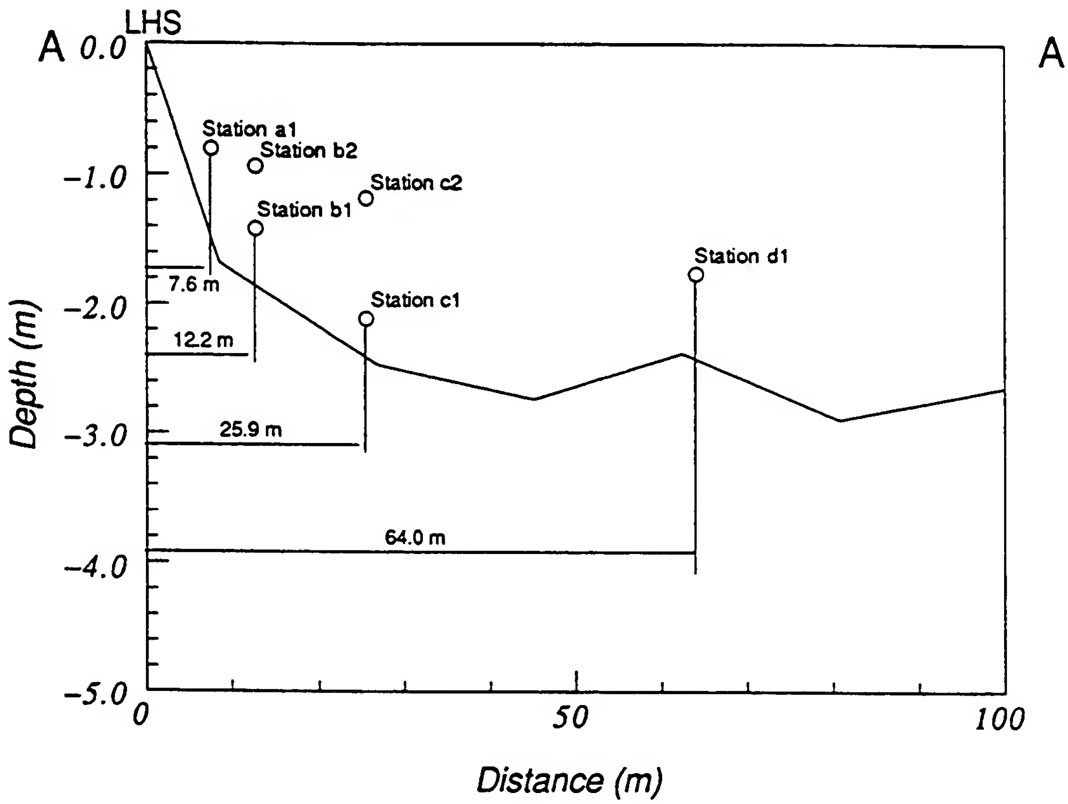
Stations A1 and A2 May 19, 1991



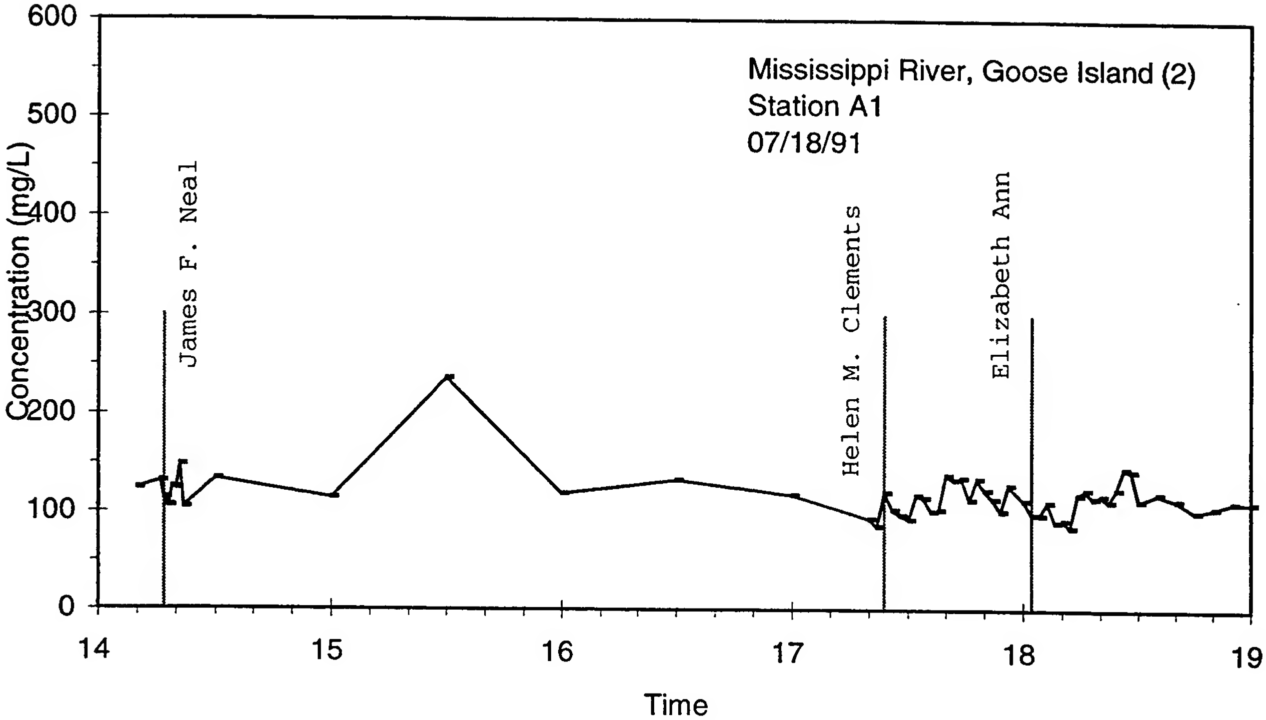


XXV-6. Variation of suspended sediment concentration with time, Goose Island, trip 2

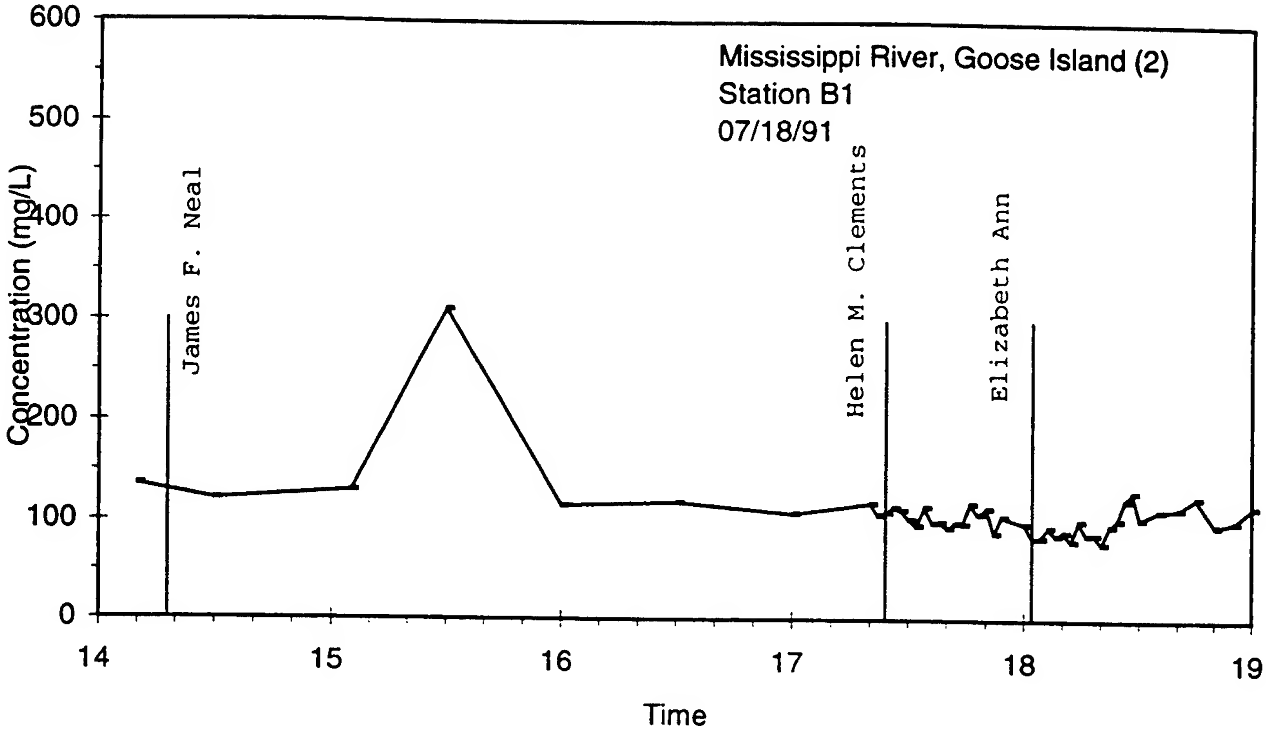
Location of suspended sediment sampling stations on the Mississippi River near the Goose Island site during July 15-25 (trip 2)

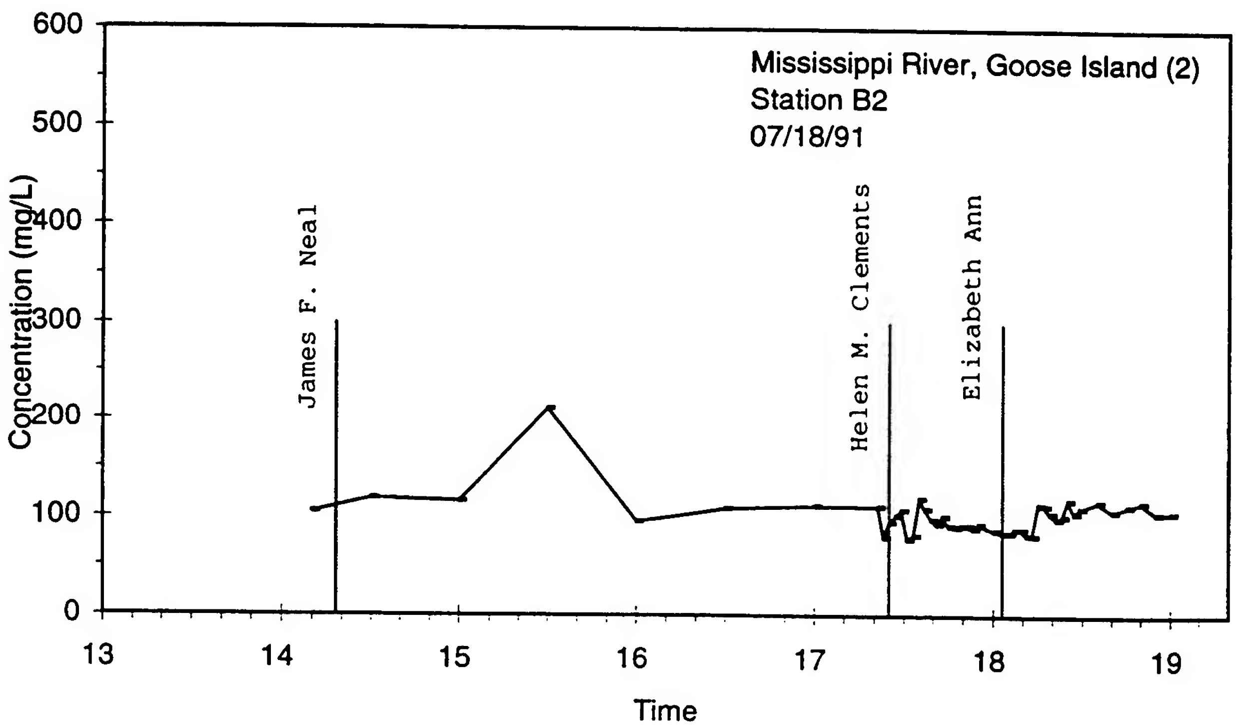


Station A1 July 18, 1991

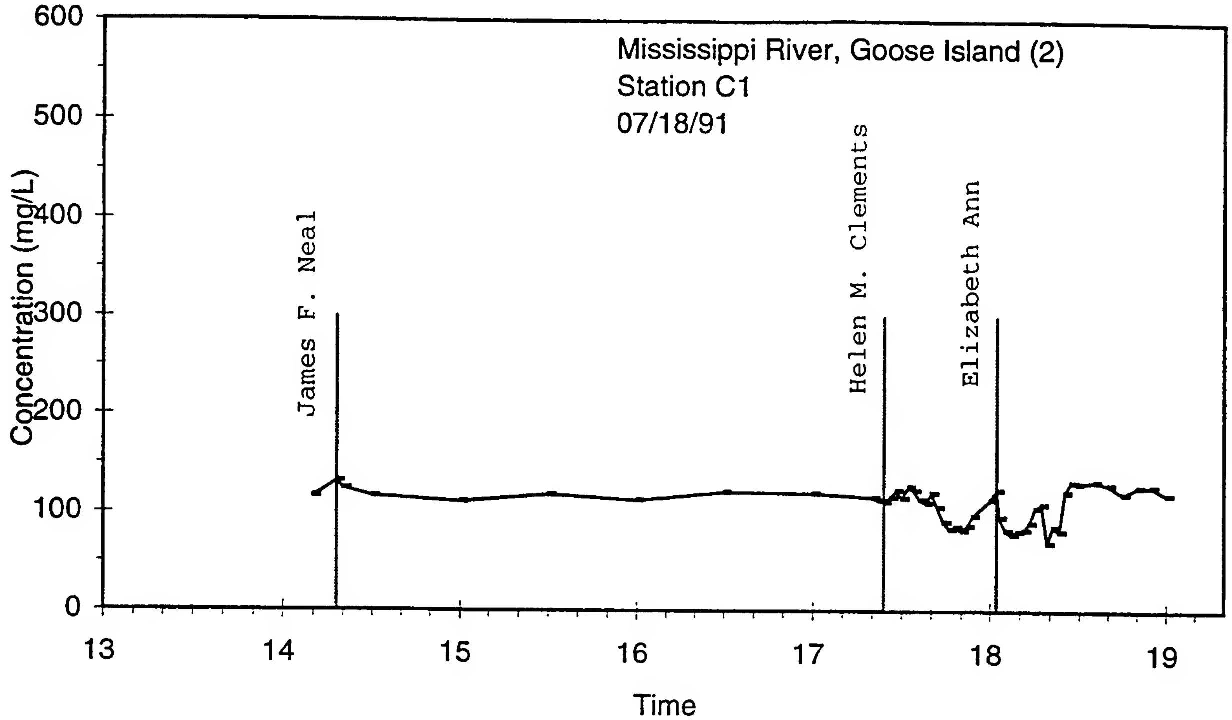


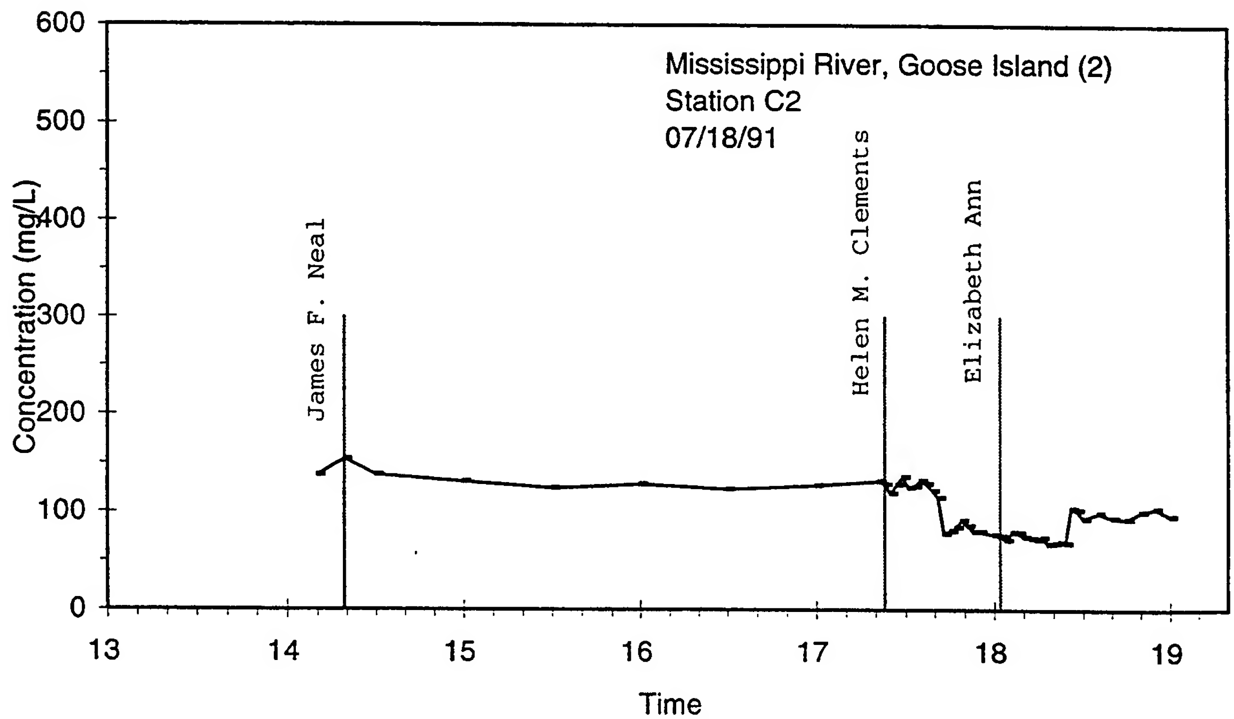
Stations B1 and B2   July 18, 1991



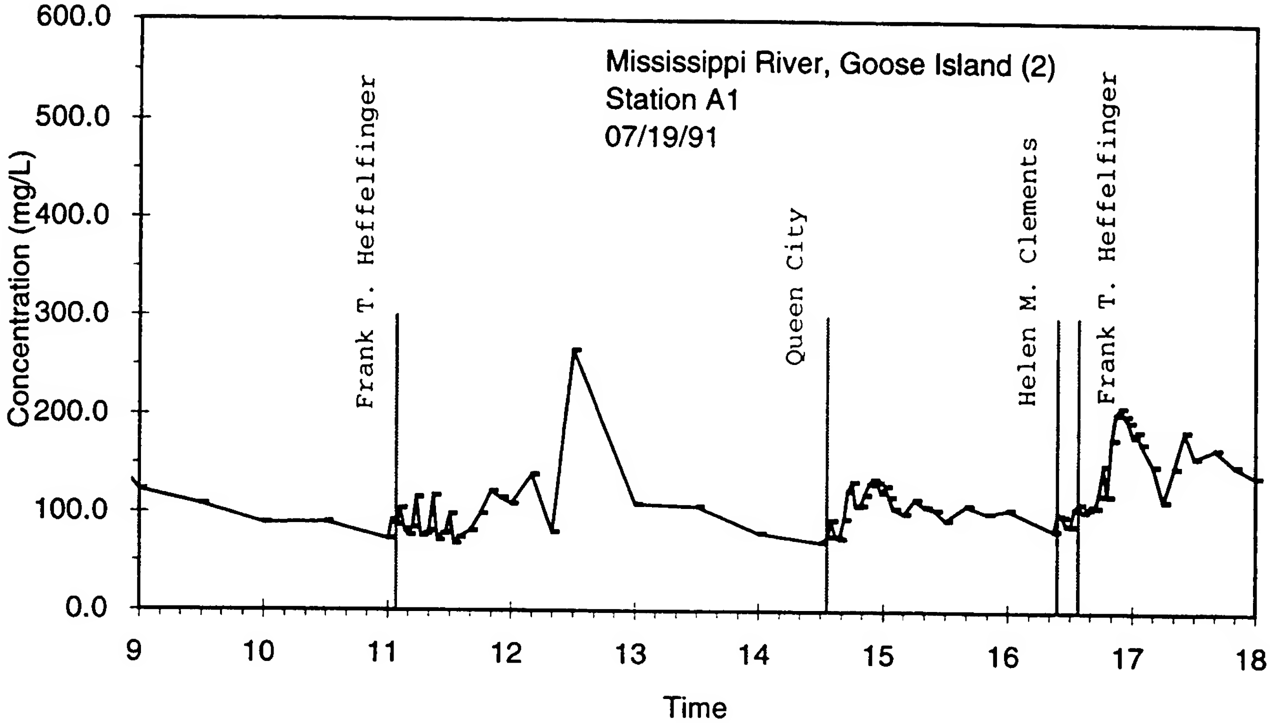


Stations C1 and C2 July 18, 1991

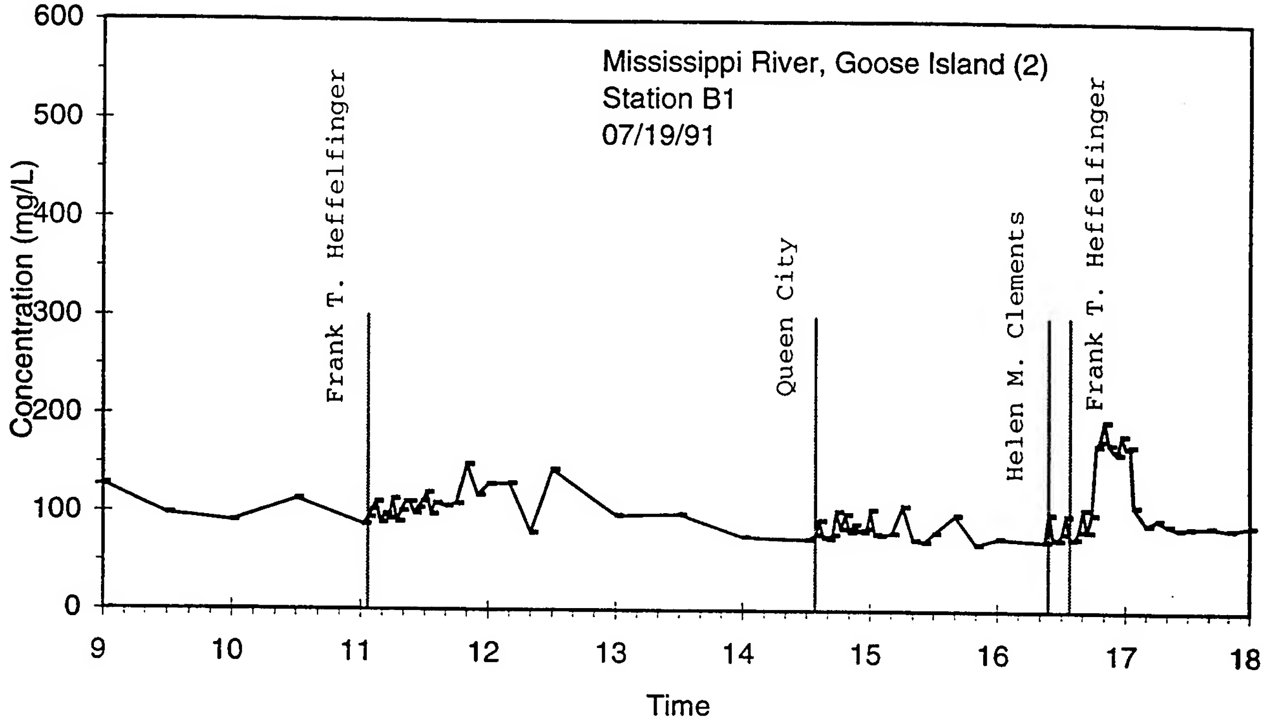


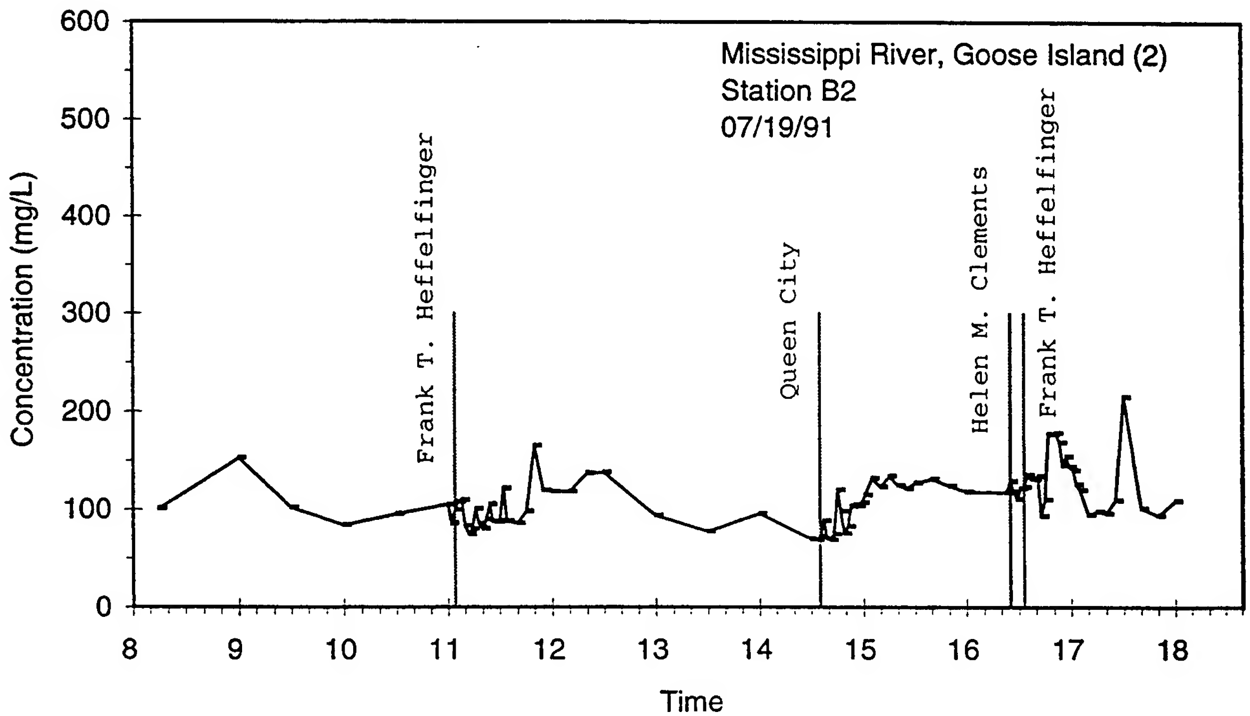


Station A1 July 19, 1991

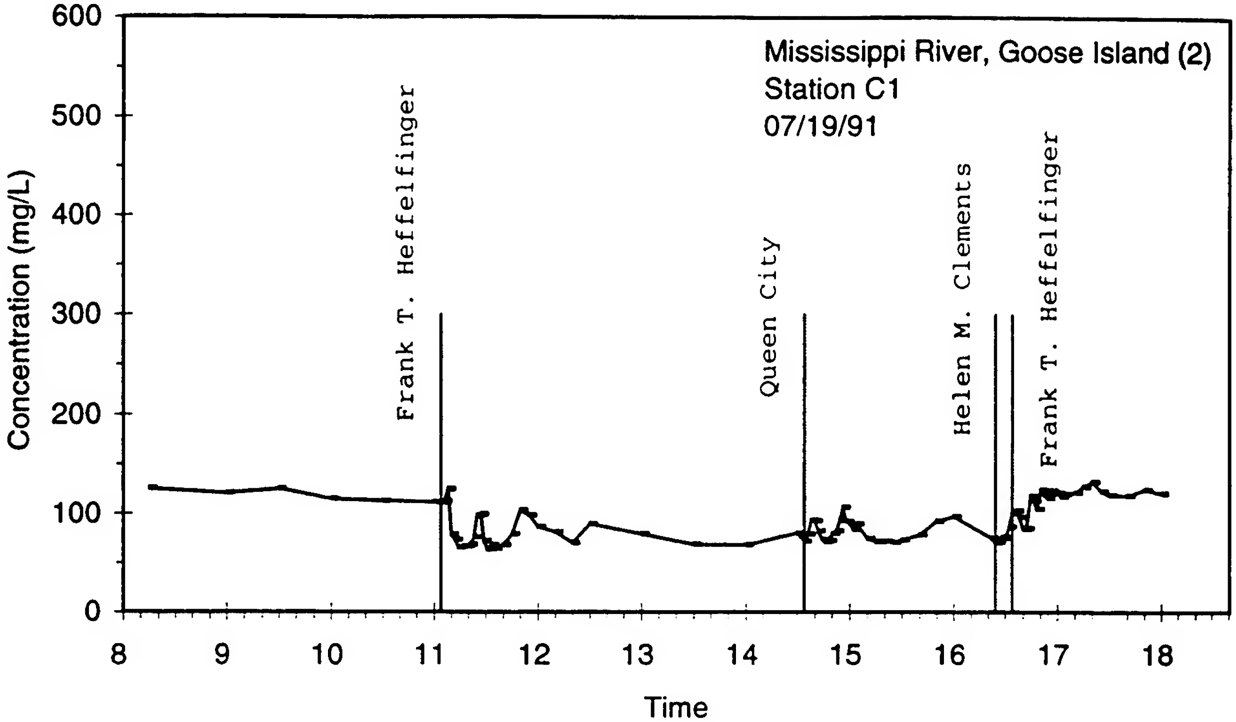


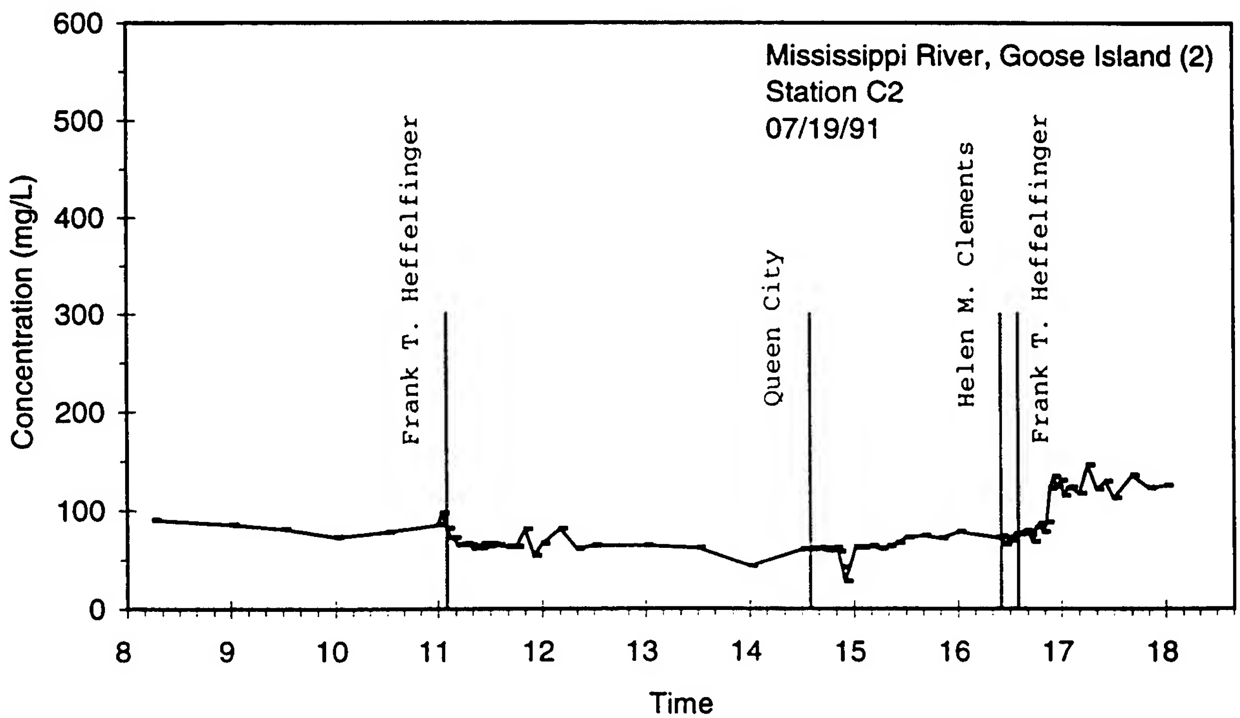
Stations B1 and B2   July 19, 1991



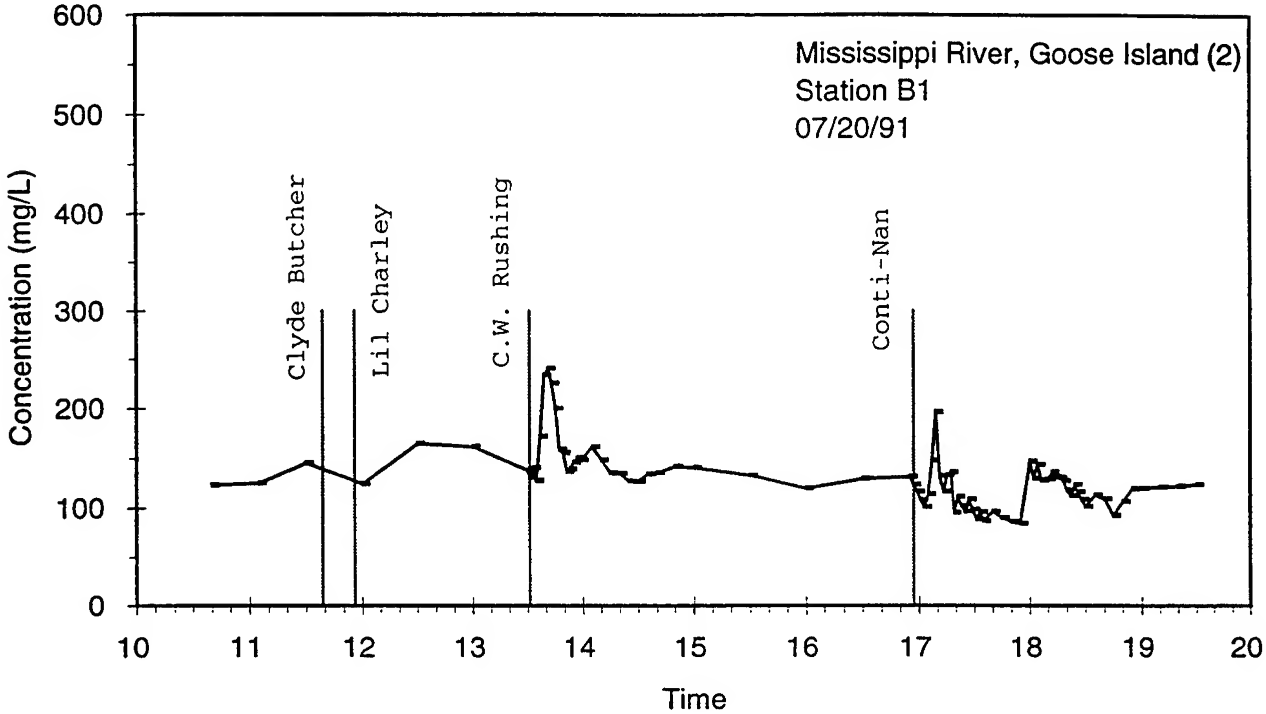


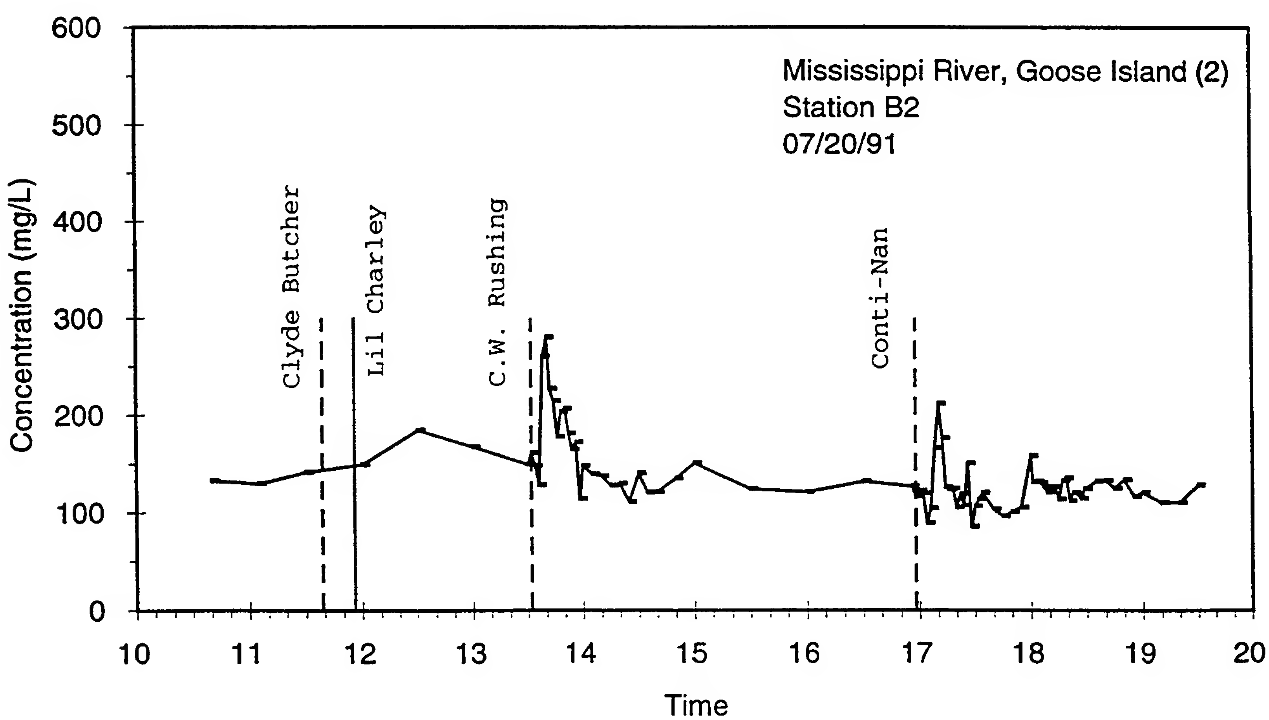
Stations C1 and C2 July 19, 1991



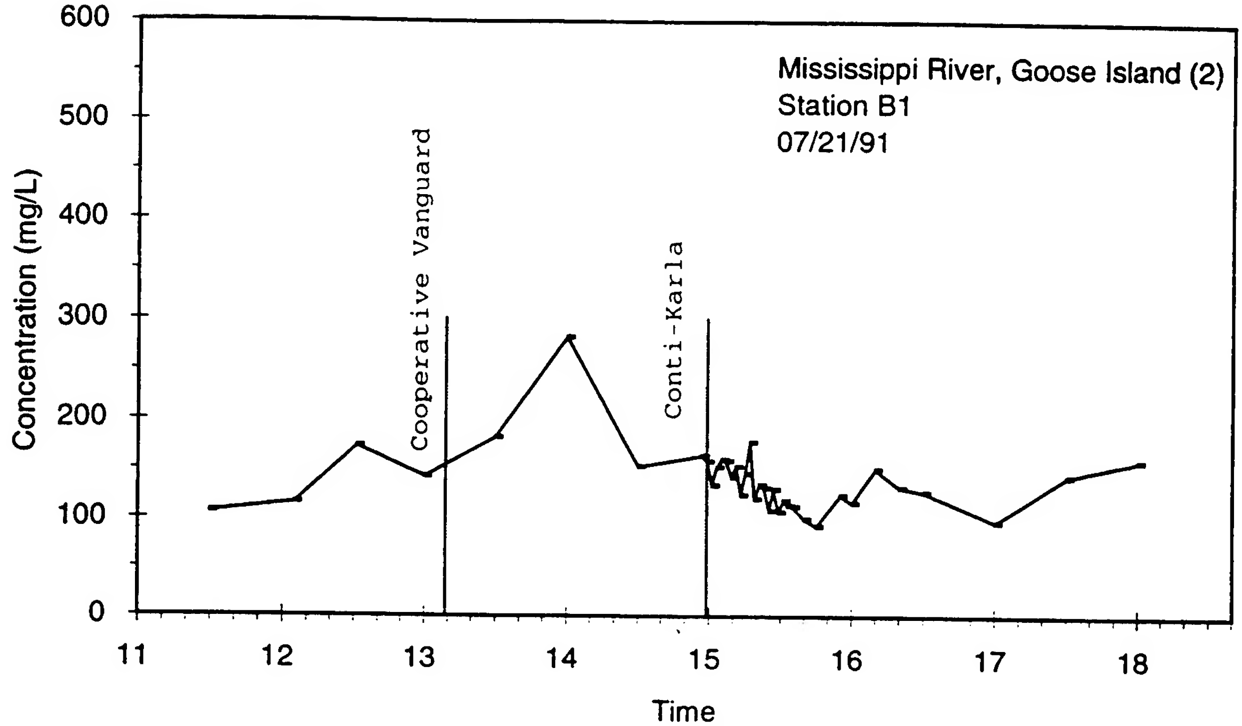


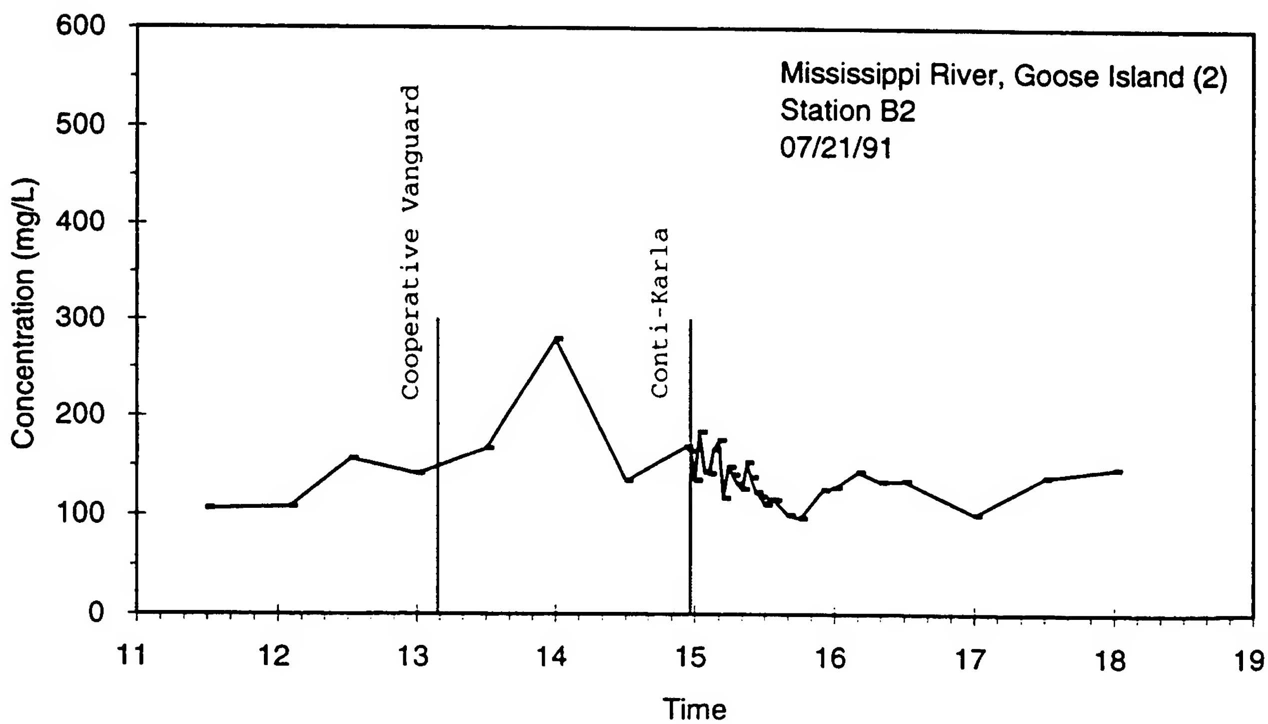
Stations B1 and B2 July 20, 1991



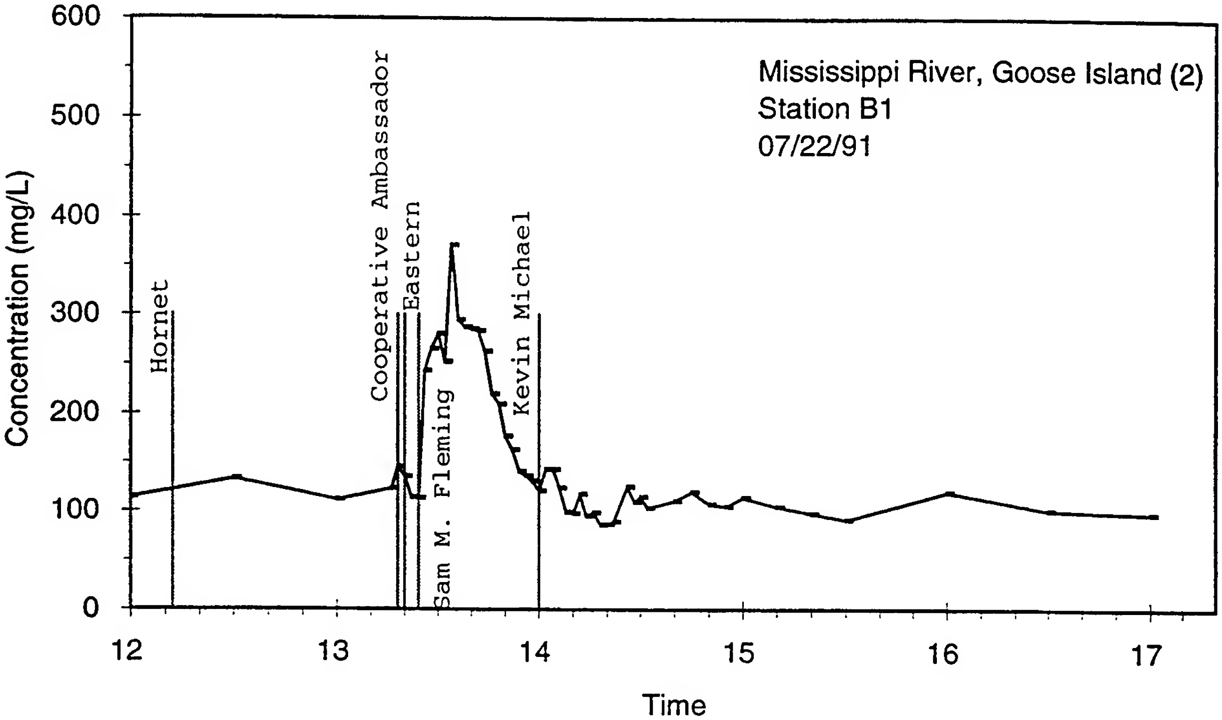


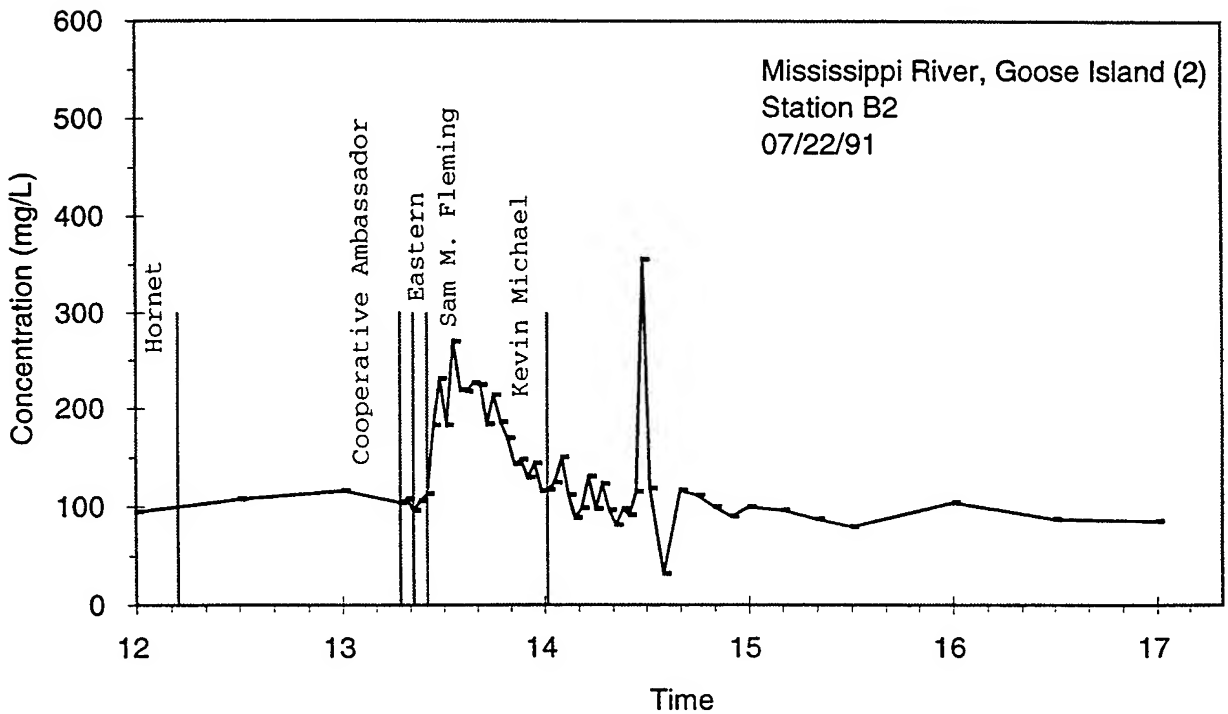
Stations B1 and B2   July 21, 1991

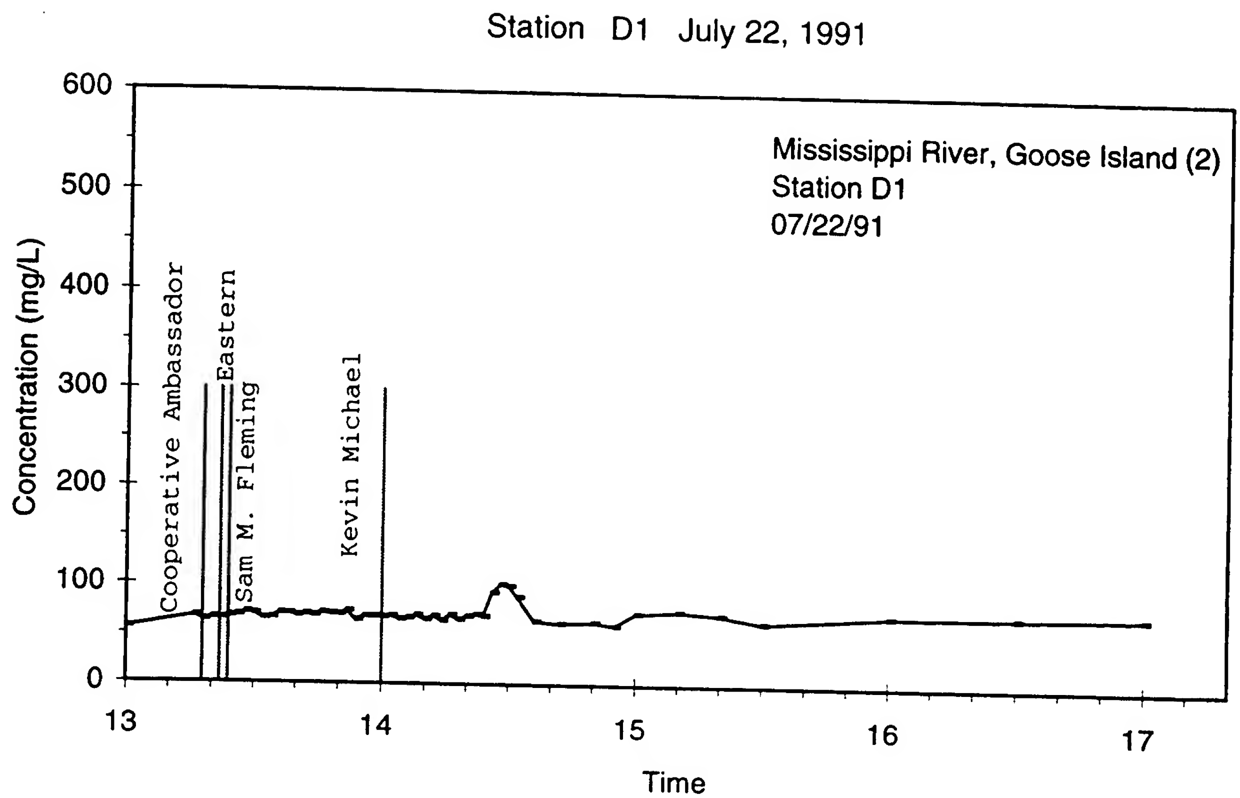




Stations B1 and B2 July 22, 1991

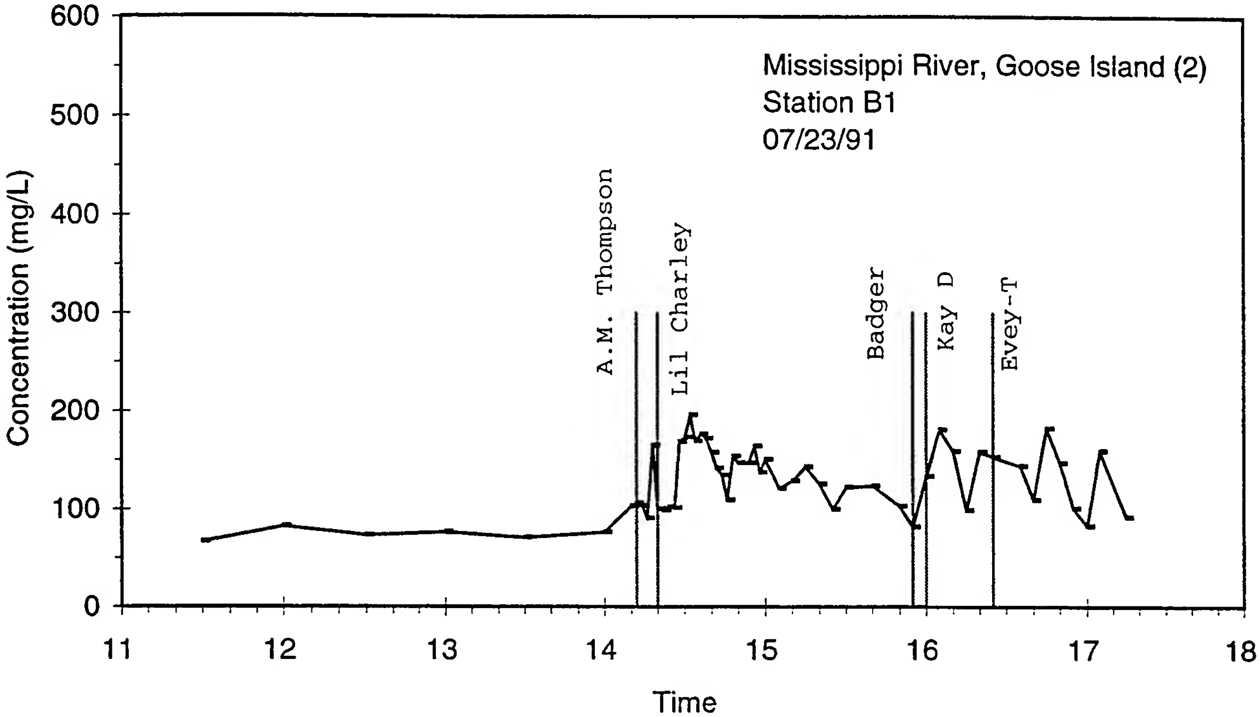


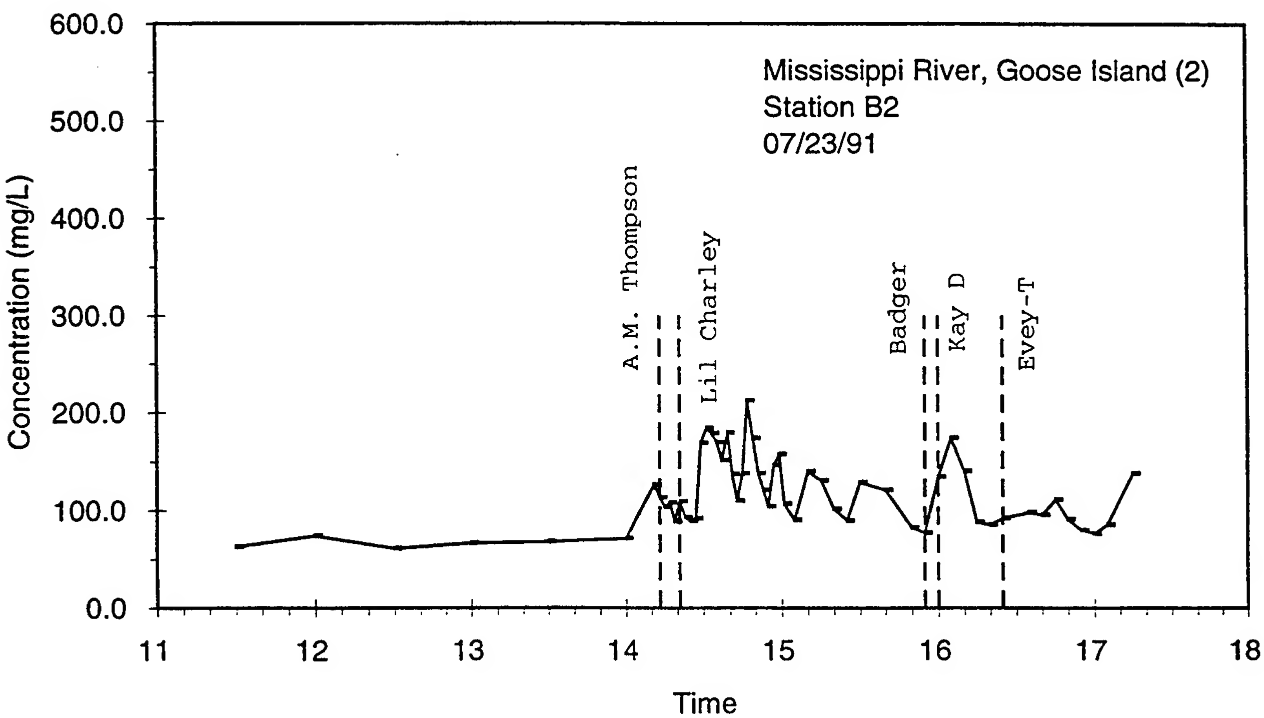




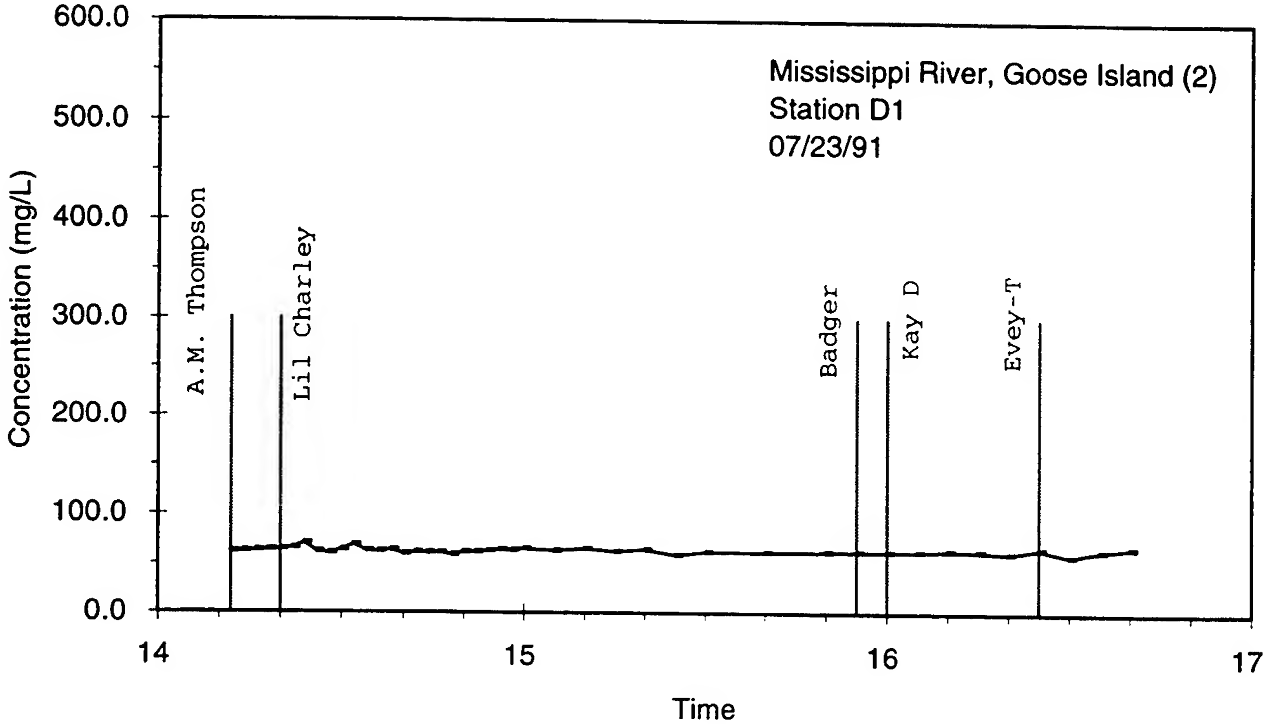
Station D1 July 22, 1991
Mississippi River, Goose Island (2)
Station D1
07/22/91
Concentration (mg/L)
0
100
200
300
400
500
600
Cooperative Ambassador
Eastern
Sam M. Fleming
Kevin Michael
13
14
15
16
17
Time

Stations B1 and B2 July 23, 1991





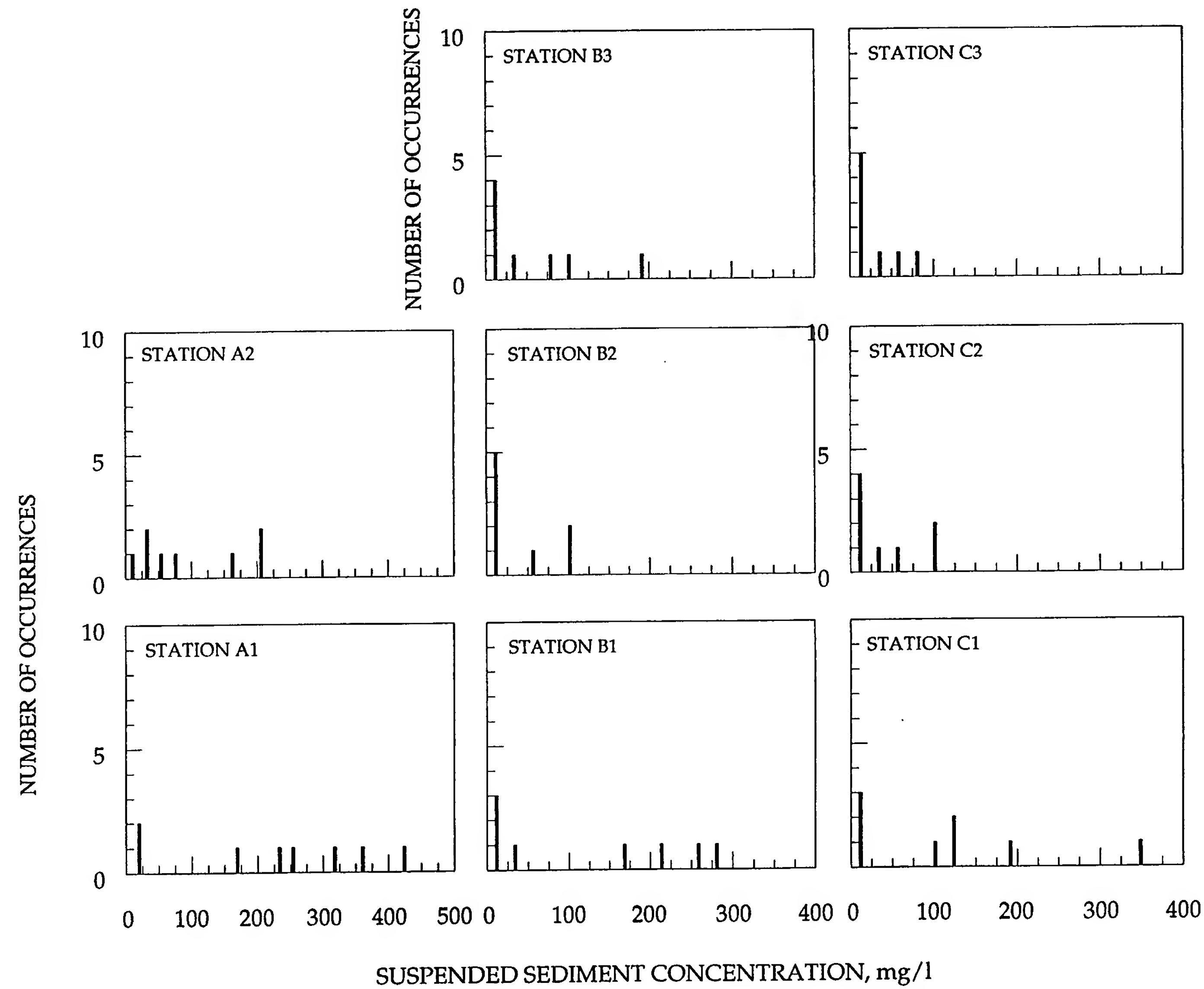
Station D1   July 23, 1991



APPENDIX XXVI.

HISTOGRAMS OF SUSPENDED SEDIMENT CONCENTRATION

McEVER'S ISLAND



XXVI-1. Histograms of maximum increased suspended sediment concentration, McEver's Island

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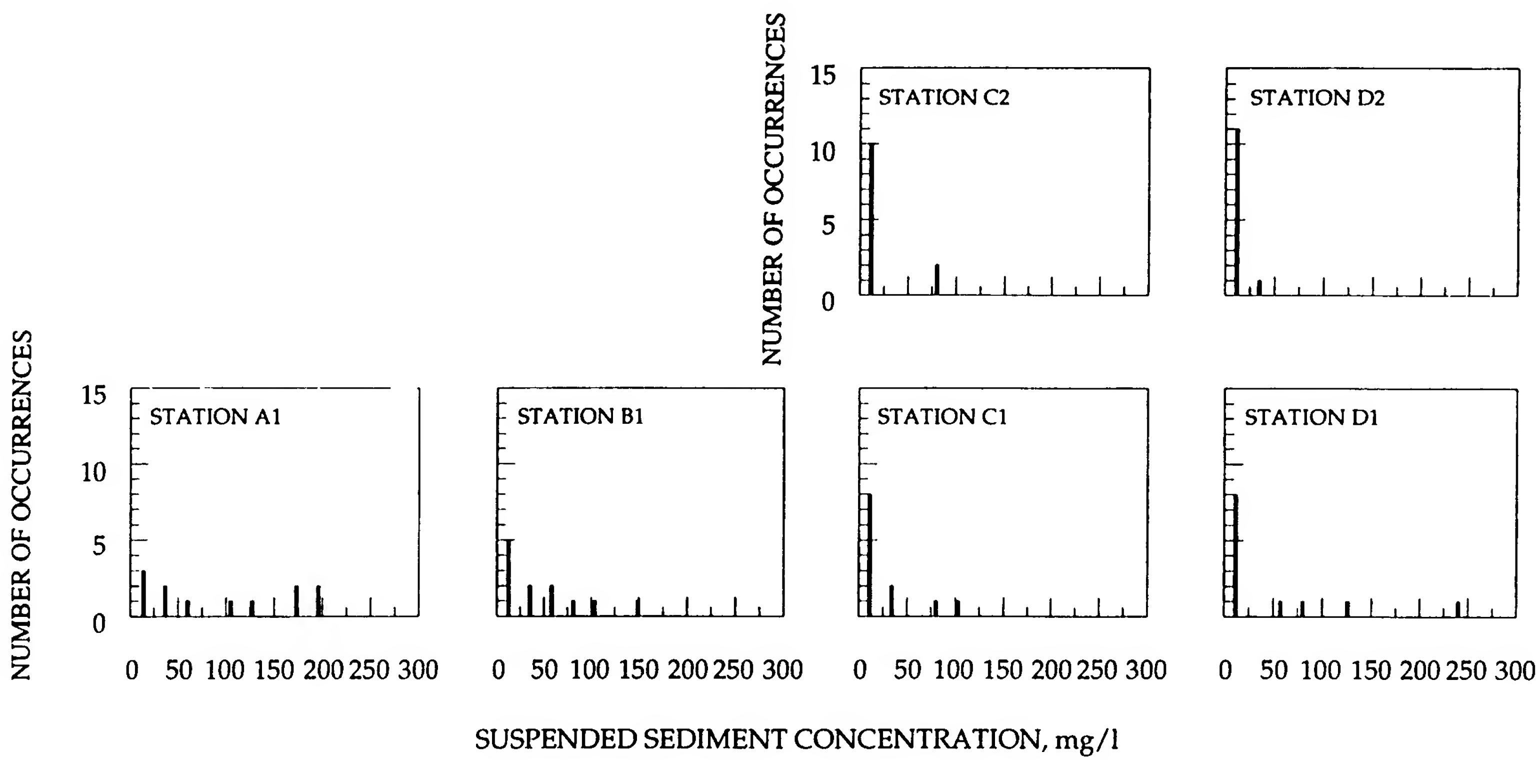
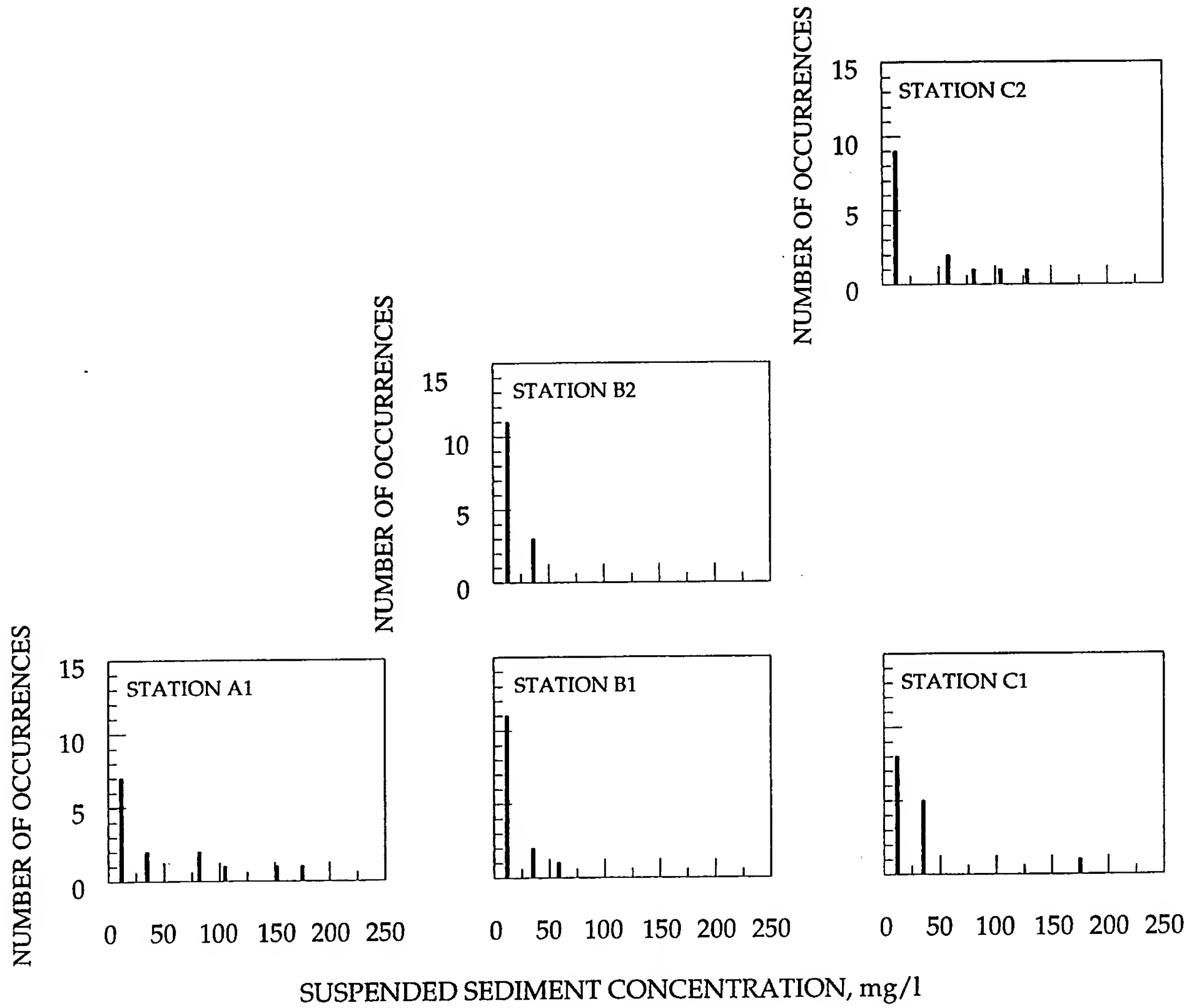
APPLE RIVER ISLAND



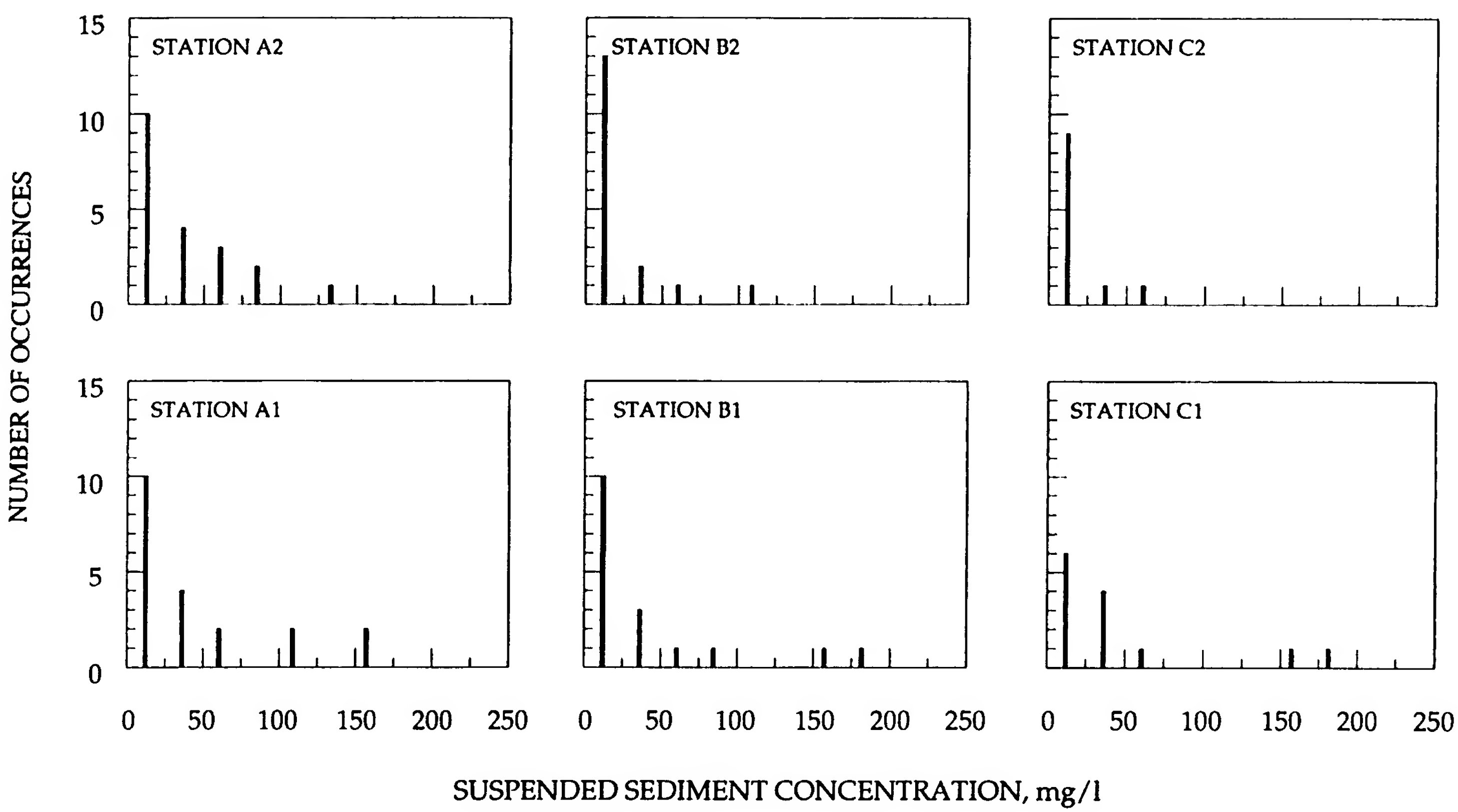
XXVI-2. Histograms of maximum increased suspended sediment concentration, Apple River Island

GOOSE ISLAND, TRIP 1

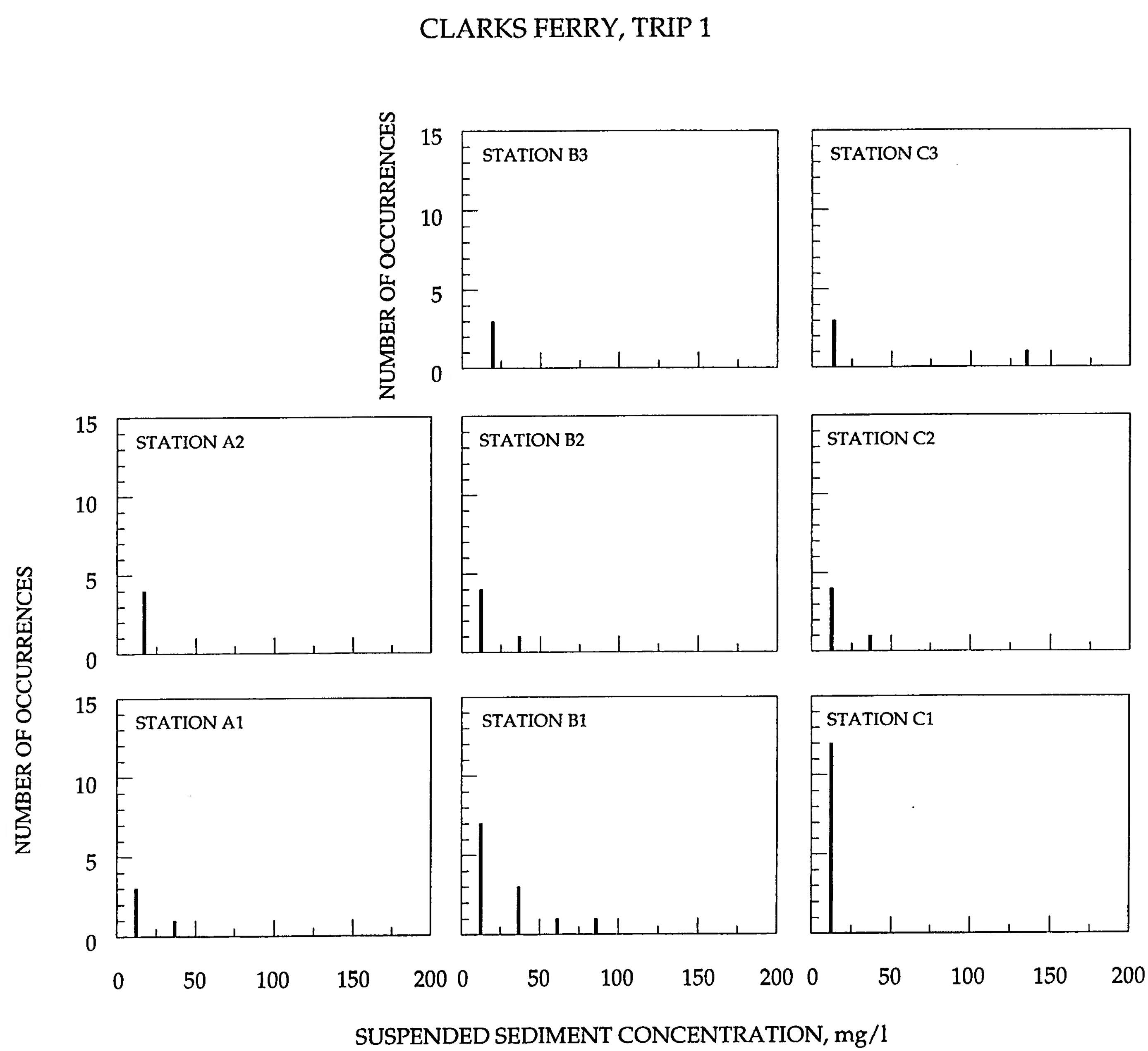


XXVI-3. Histograms of maximum increased suspended sediment concentration, Goose Island, trip 1

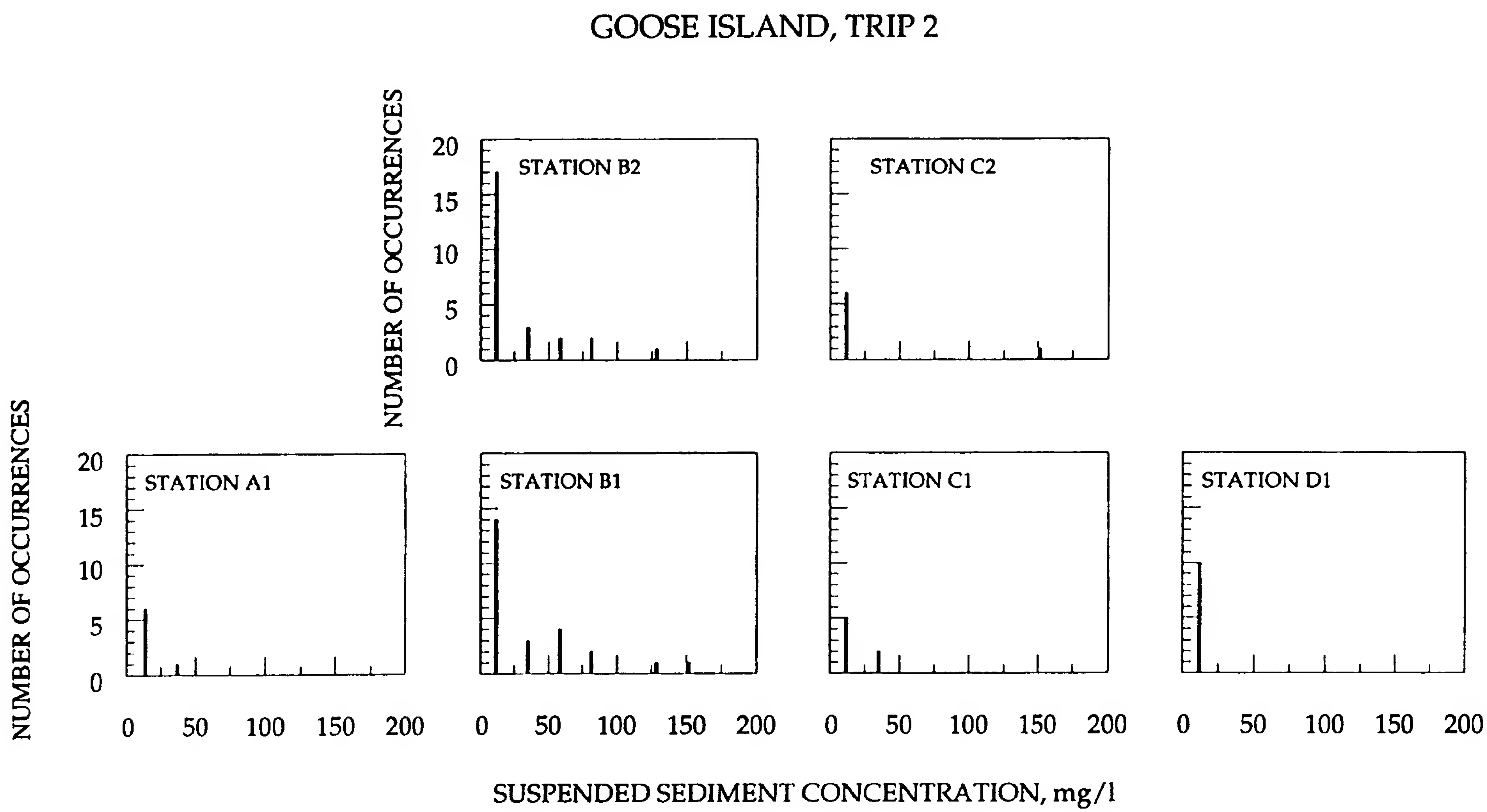
KAMPSVILLE, TRIP 1



XXVI-4. Histograms of maximum increased suspended sediment concentration, Kampsville, trip 1

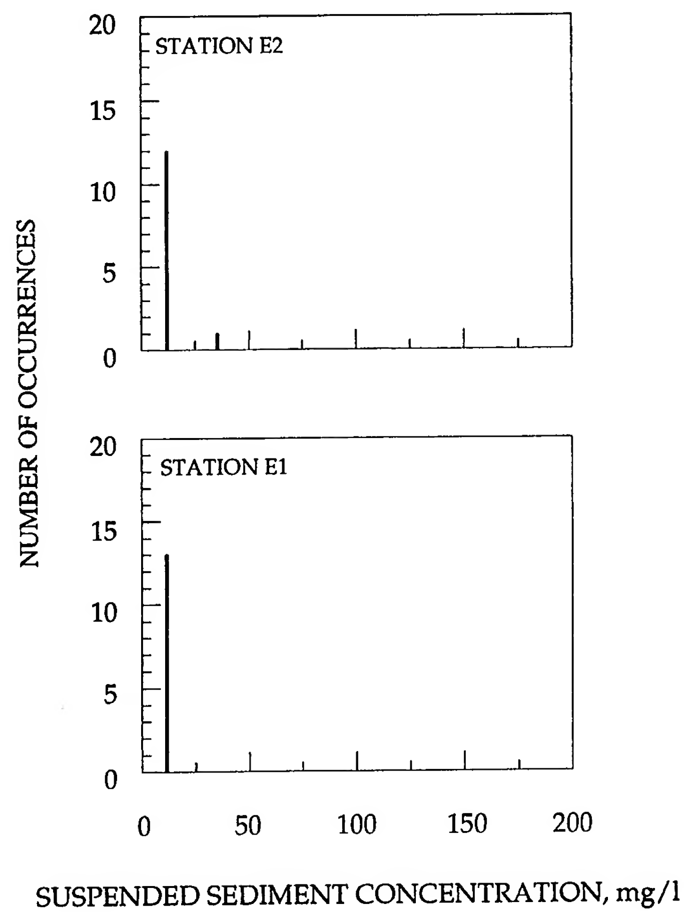


XXVI-5. Histograms of maximum increased suspended sediment concentration, Clarks Ferry, trip 1



XXVI-6. Histograms of maximum increased suspended sediment concentration, Goose Island, trip 2

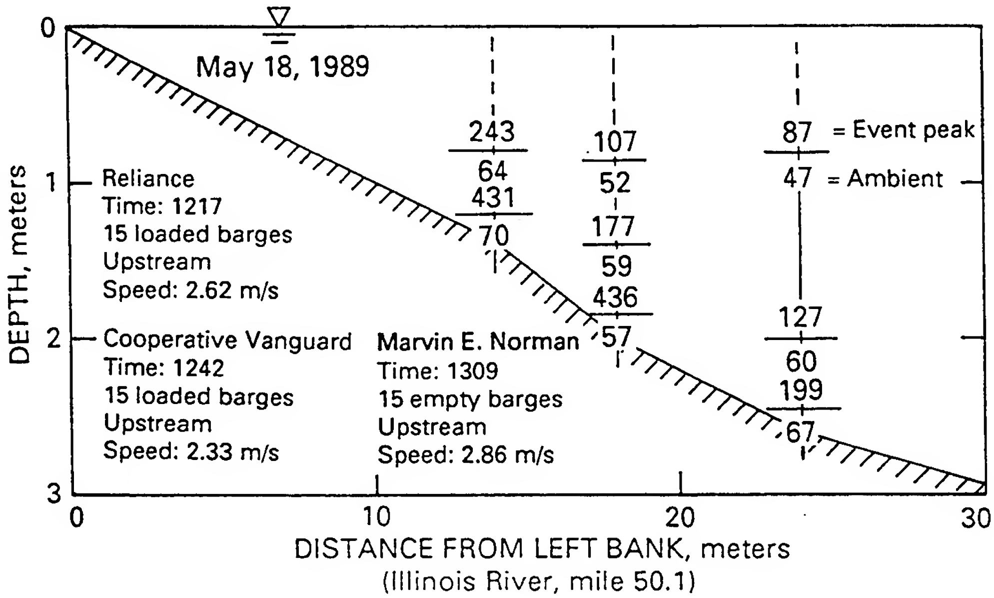
GOOSE ISLAND, TRIP 2

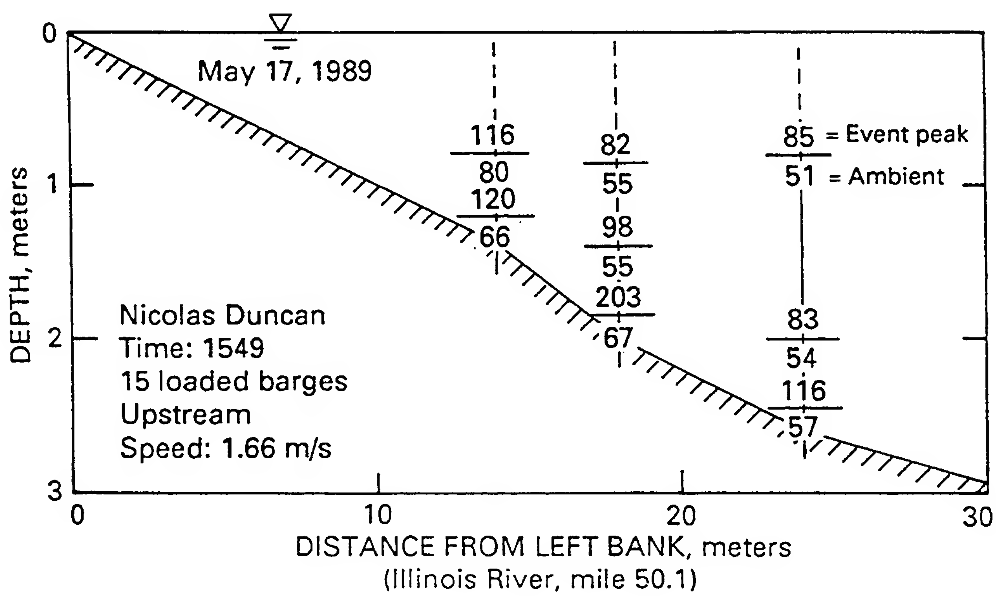


XXVI-6. Concluded

APPENDIX XXVII.

RATIO OF PEAK TO AVERAGE SUSPENDED SEDIMENT CONCENTRATION DUE TO MOVEMENT OF NAVIGATION TRAFFIC





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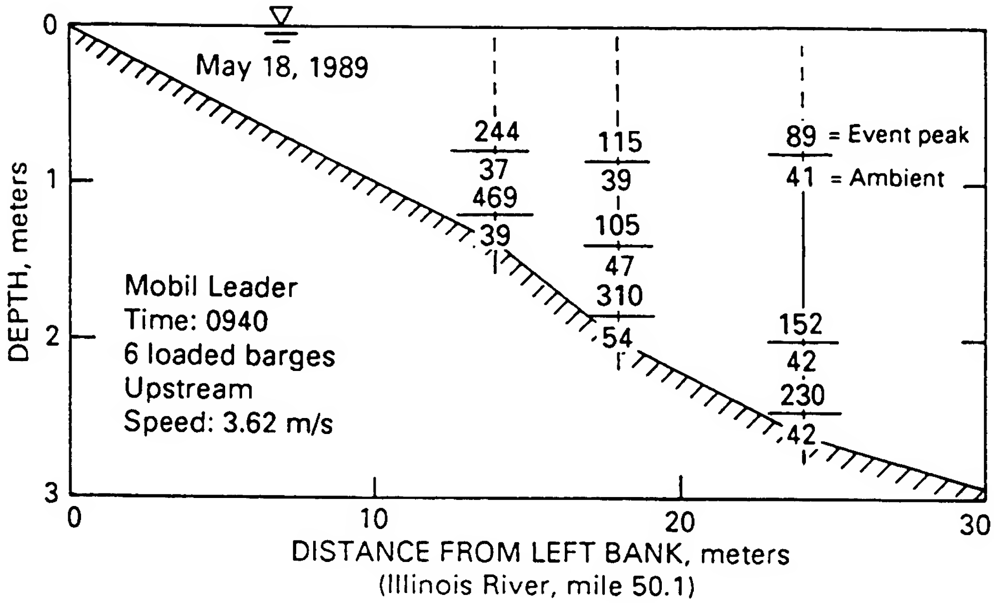
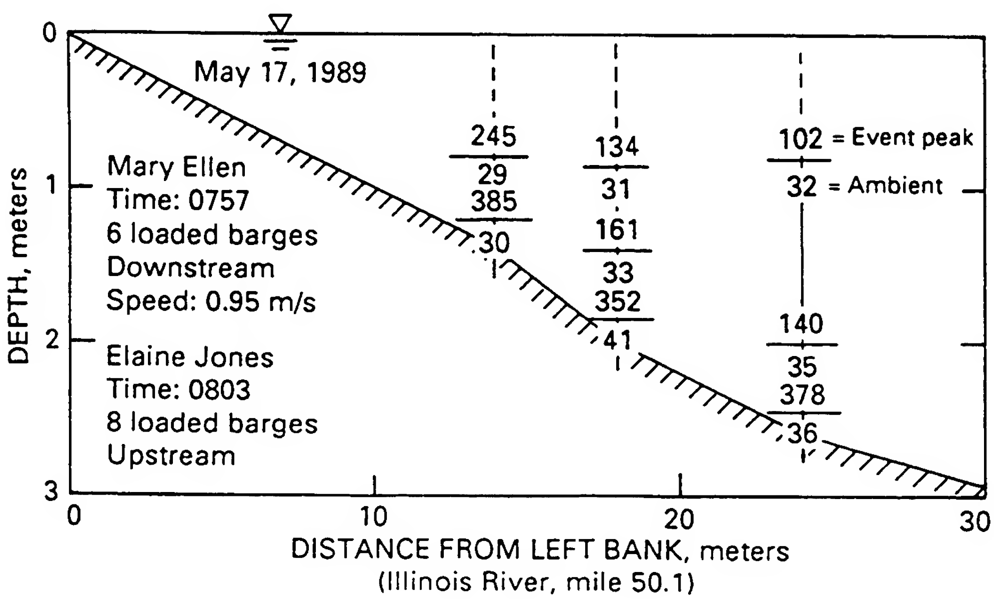
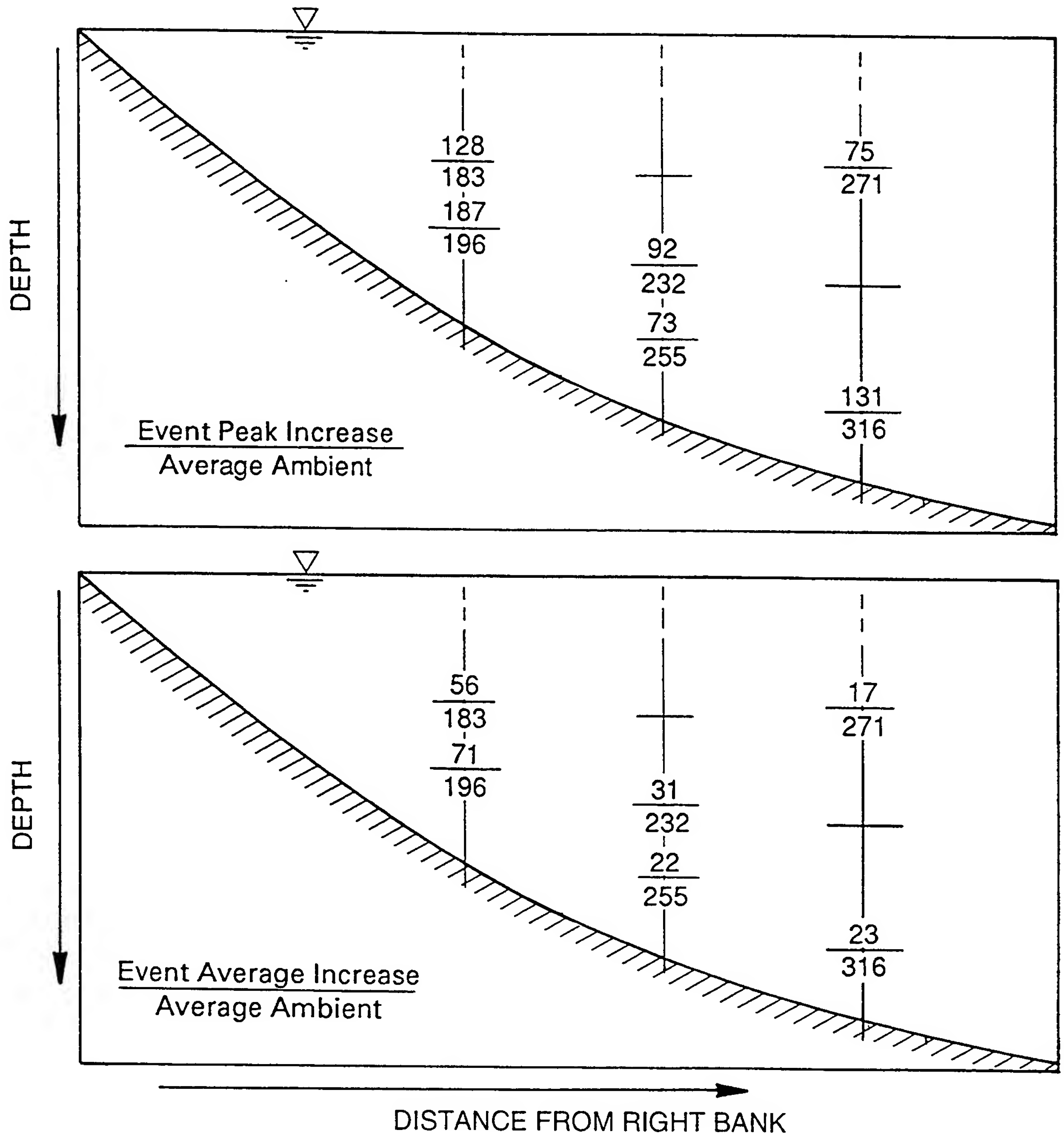
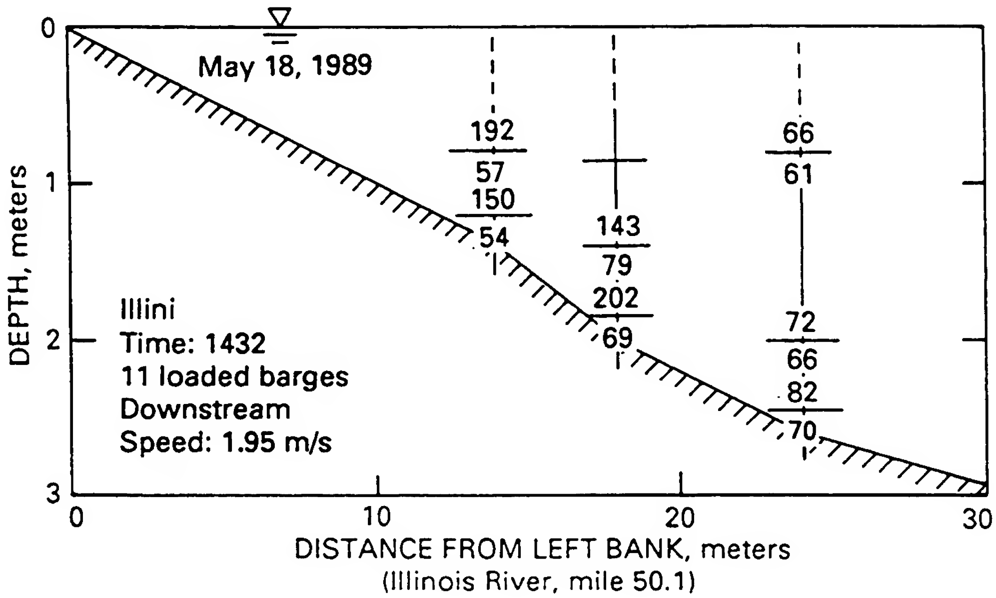

May 18, 1989
244
37
469
39
115
39
105
47
310
54
89 = Event peak
41 = Ambient
152
42
230
42
Mobil Leader
Time: 0940
6 loaded barges
Upstream
Speed: 3.62 m/s
DEPTH, meters
0
1
2
3
0
10
20
30
DISTANCE FROM LEFT BANK, meters
(Illinois River, mile 50.1)


May 17, 1989
245
29
385
30
134
31
161
33
352
41
102 = Event peak
32 = Ambient
140
35
378
36
Mary Ellen
Time: 0757
6 loaded barges
Downstream
Speed: 0.95 m/s
Elaine Jones
Time: 0803
8 loaded barges
Upstream
DEPTH, meters
0
1
2
3
0
10
20
30
DISTANCE FROM LEFT BANK, meters
(Illinois River, mile 50.1)

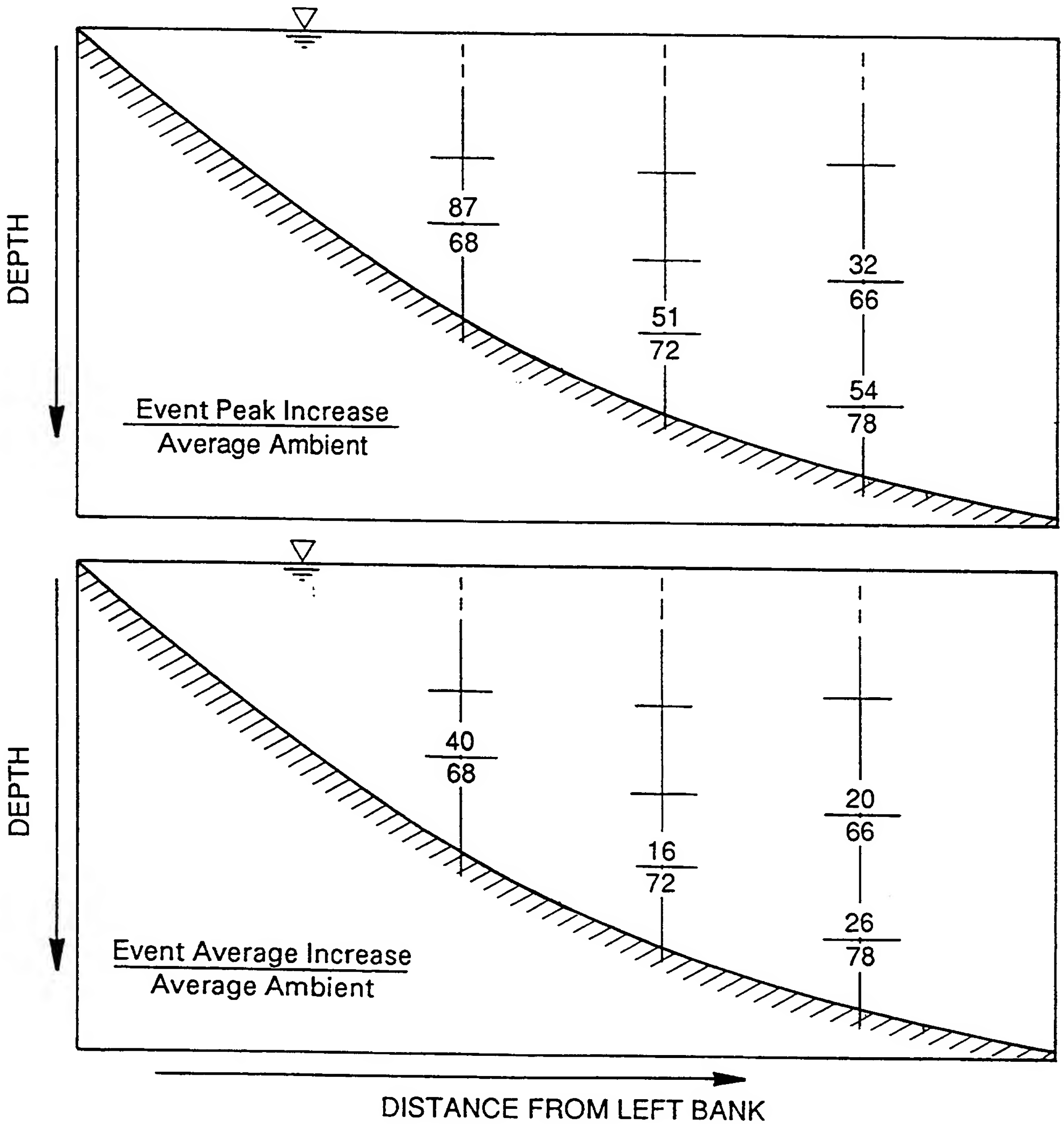
Illinois River, mile 35.3, October 1990
Average Suspended Sediment Concentrations, mg/L



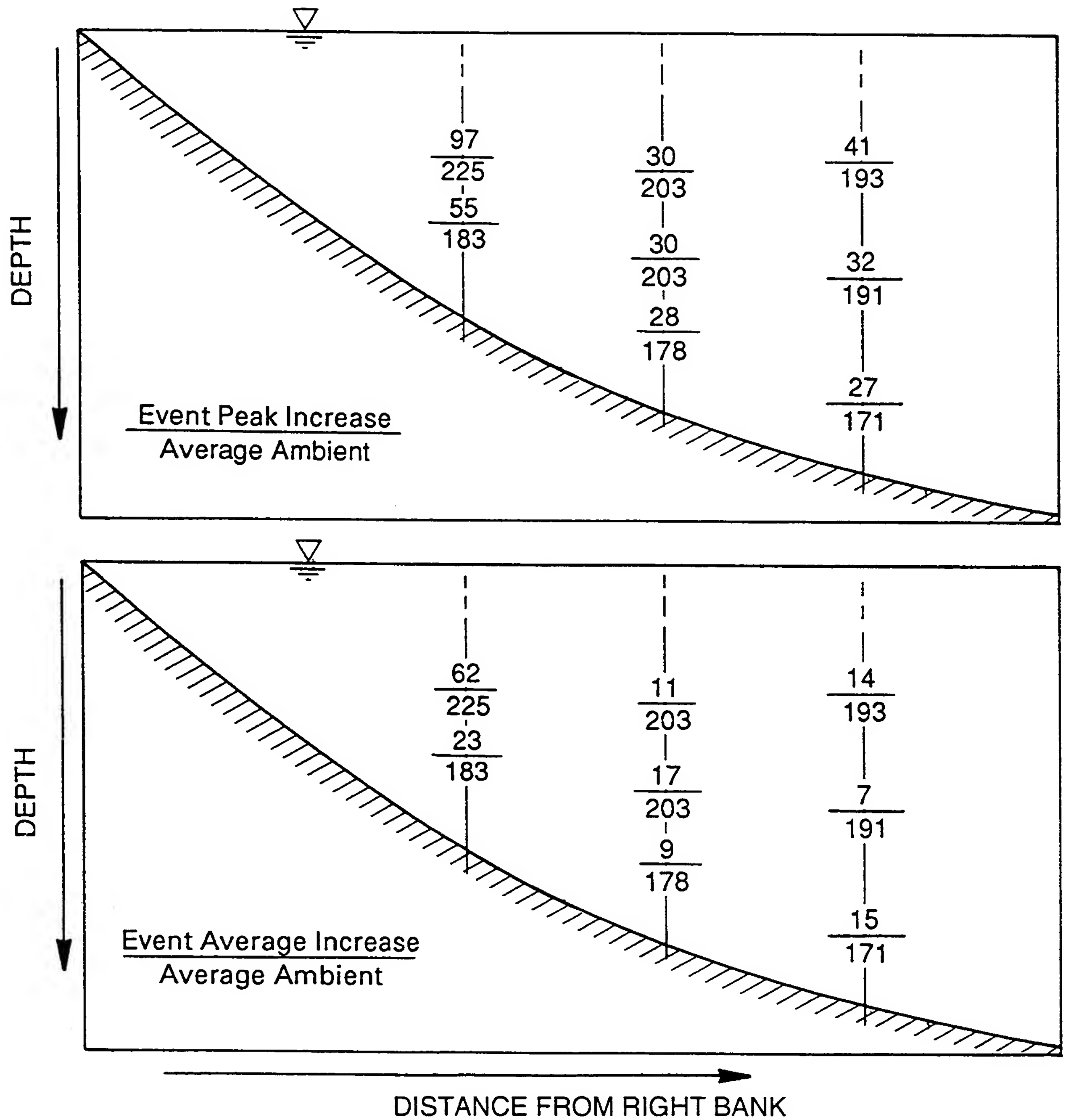


May 18, 1989
192
57
150
54
143
79
202
69
66
61
72
66
82
70
Illini
Time: 1432
11 loaded barges
Downstream
Speed: 1.95 m/s
DEPTH, meters
0
1
2
3
0
10
20
30
DISTANCE FROM LEFT BANK, meters
(Illinois River, mile 50.1)

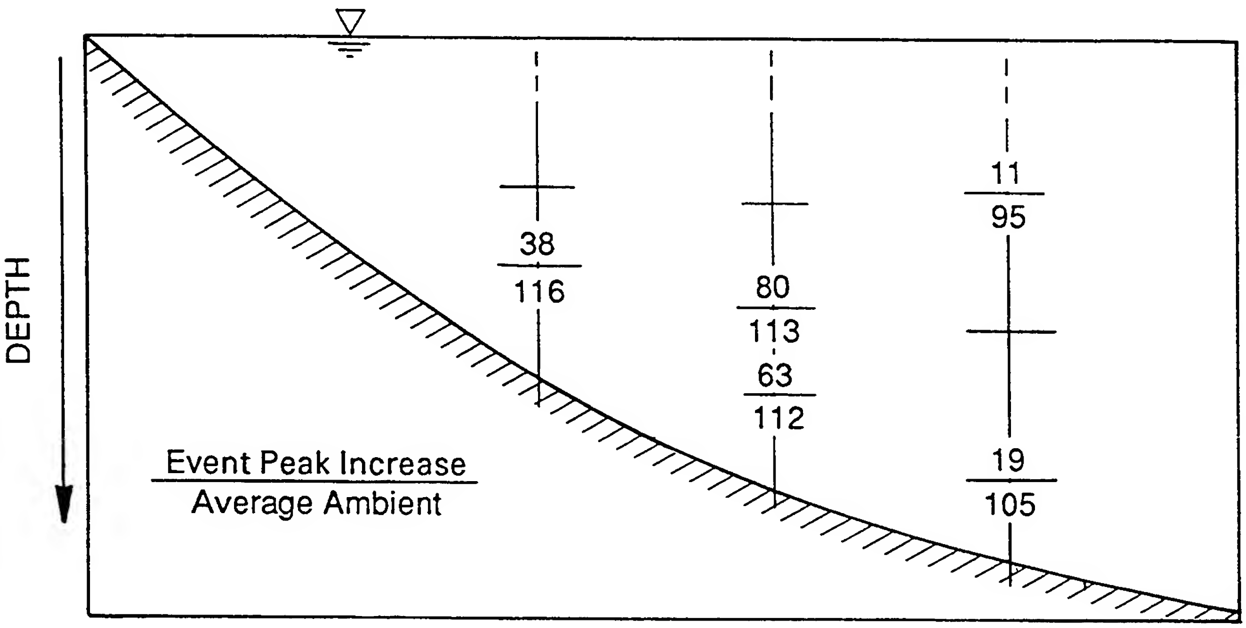
Mississippi River, mile 546.7, May 1990
Average Suspended Sediment Concentrations, mg/L

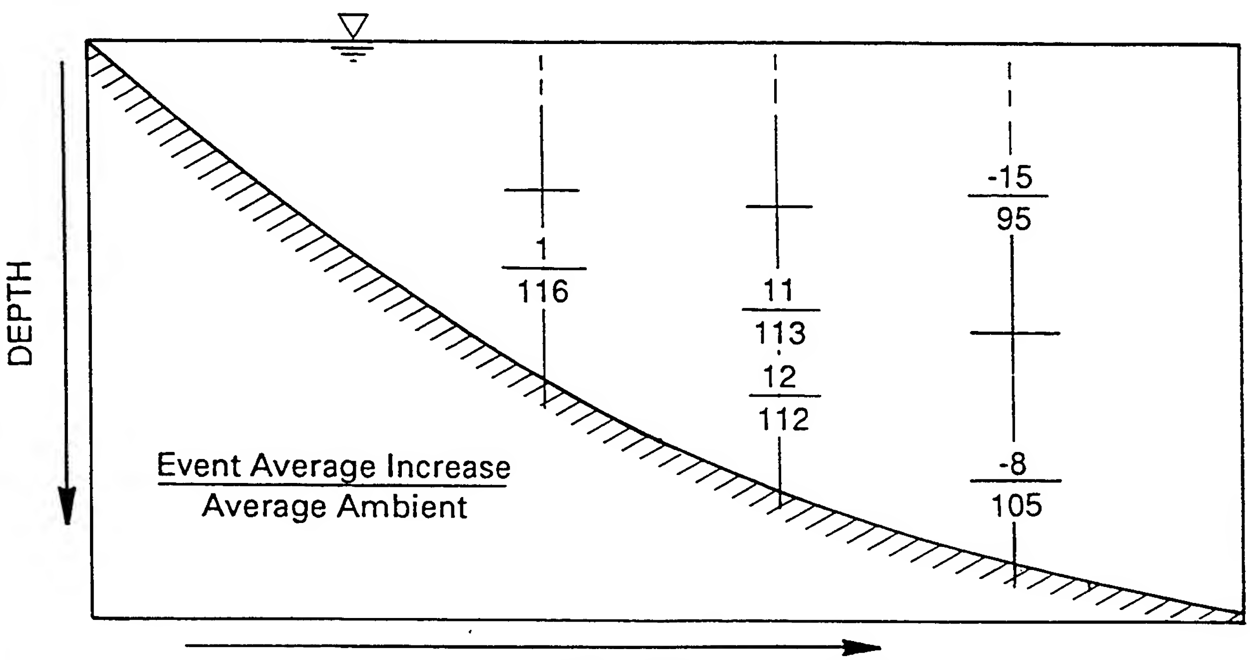


Mississippi River, mile 468.2, May 1992
Average Suspended Sediment Concentrations, mg/L

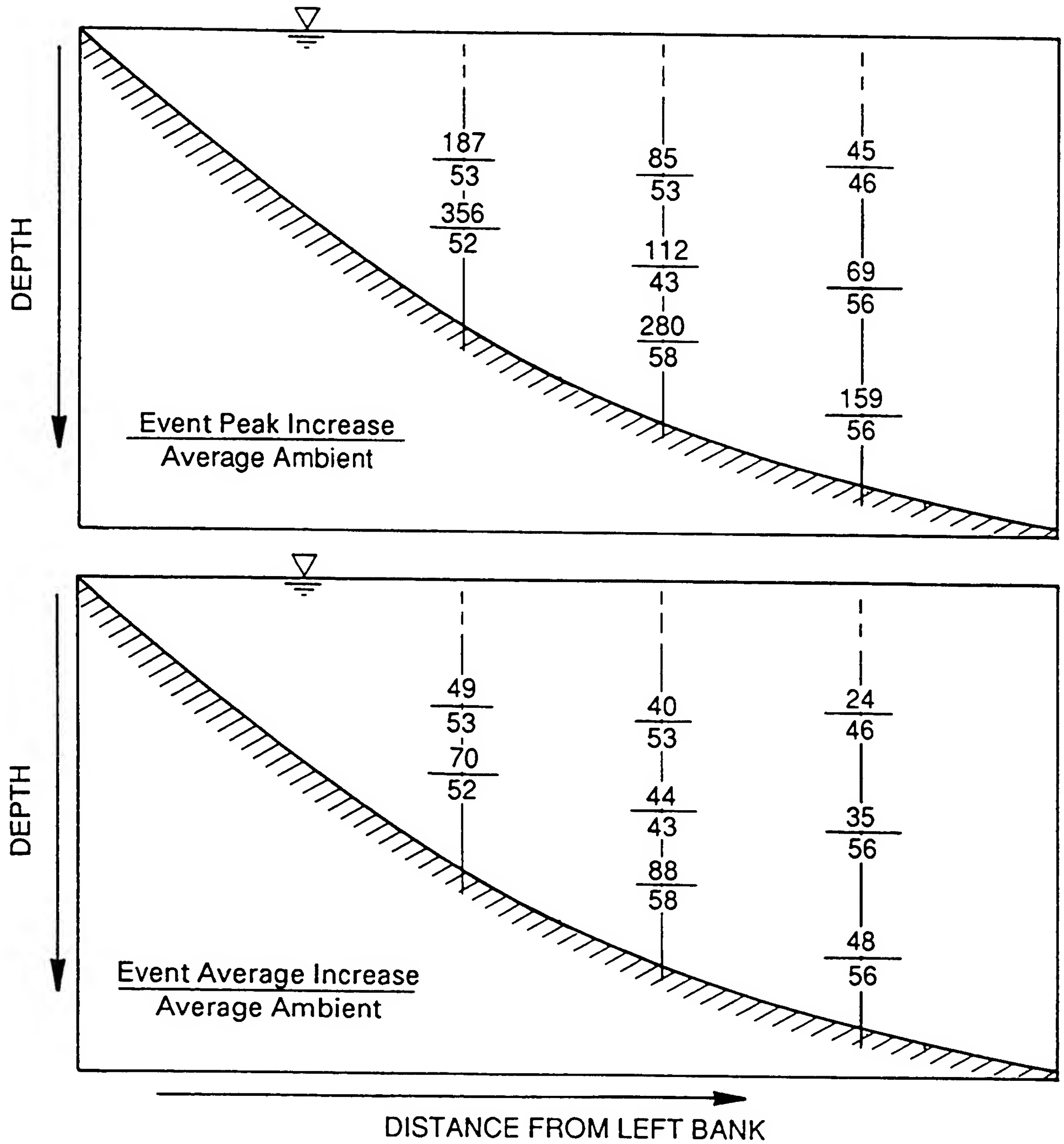


Mississippi River, mile 319.3, July 1991
Average Suspended Sediment Concentrations, mg/L

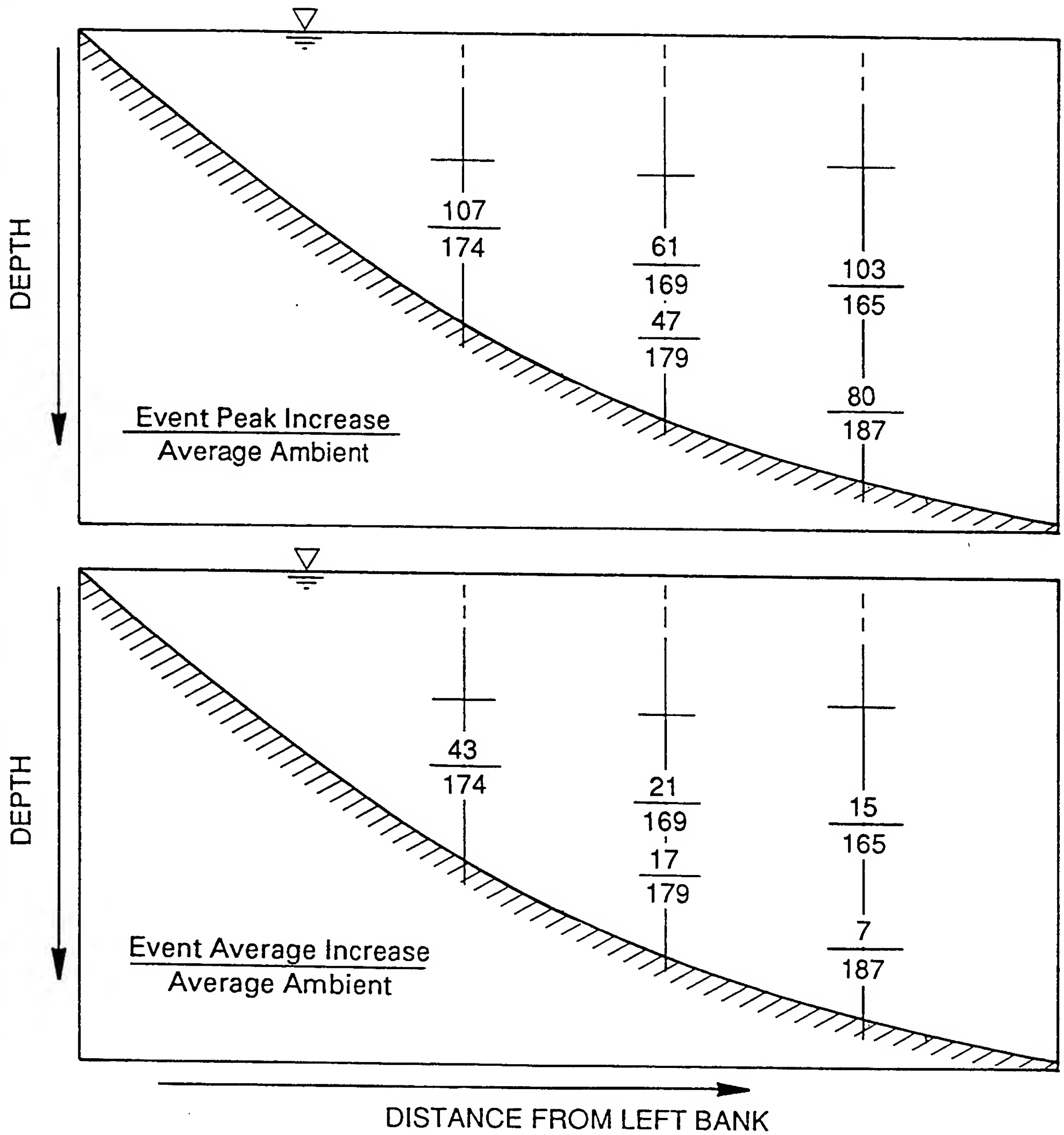




Illinois River, mile 50.1, May 1989
Average Suspended Sedimient Concentrations, mg/L



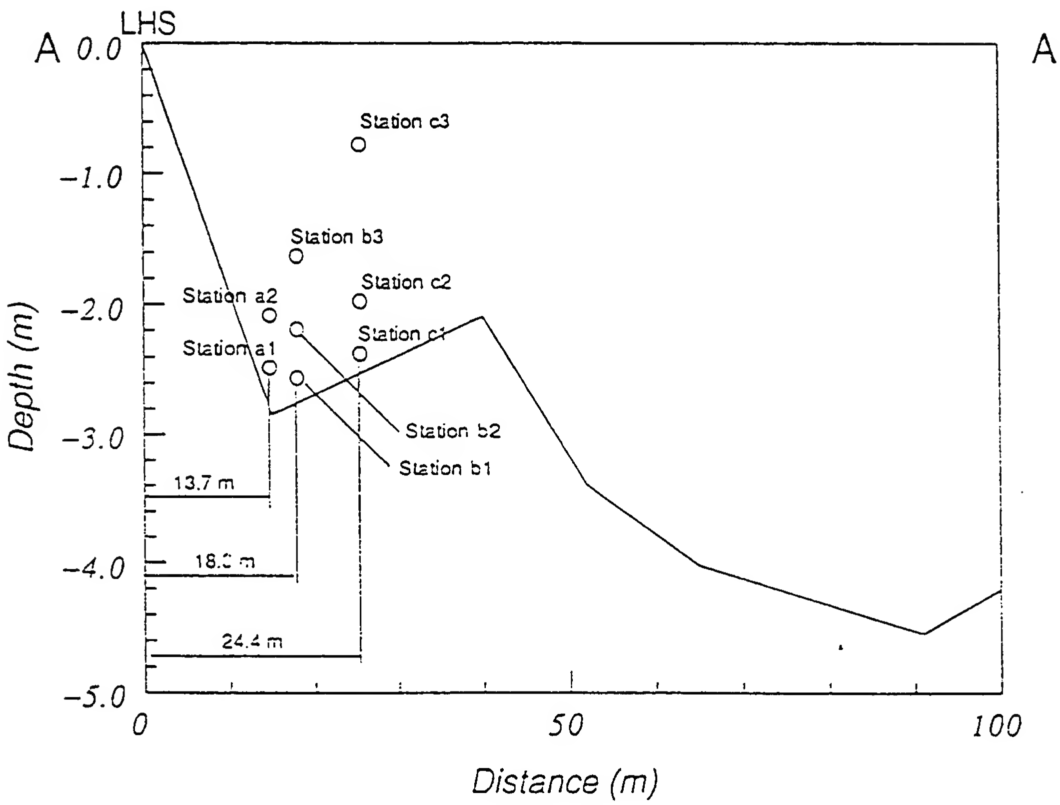
Mississippi River, mile 319.3, August 1990
Average Suspended Sediment Concentrations, mg/L



APPENDIX XXVIII.

COMPARISON OF TURBIDITY AND SUSPENDED SEDIMENT CONCENTRATION AT MCEVER'S ISLAND

Location of suspended sediment sampling stations
on the Illinois River near the McEver's Island site



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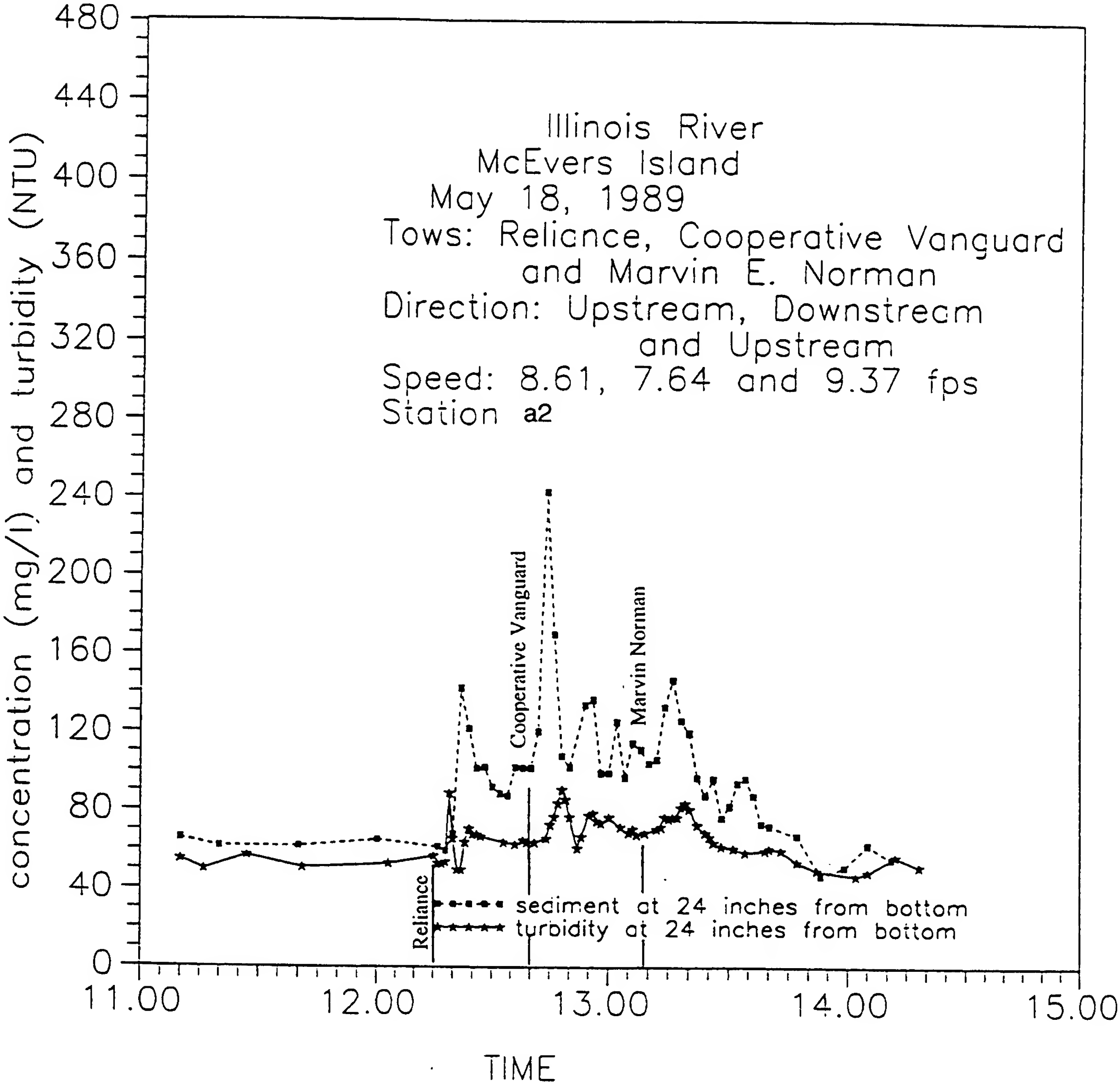
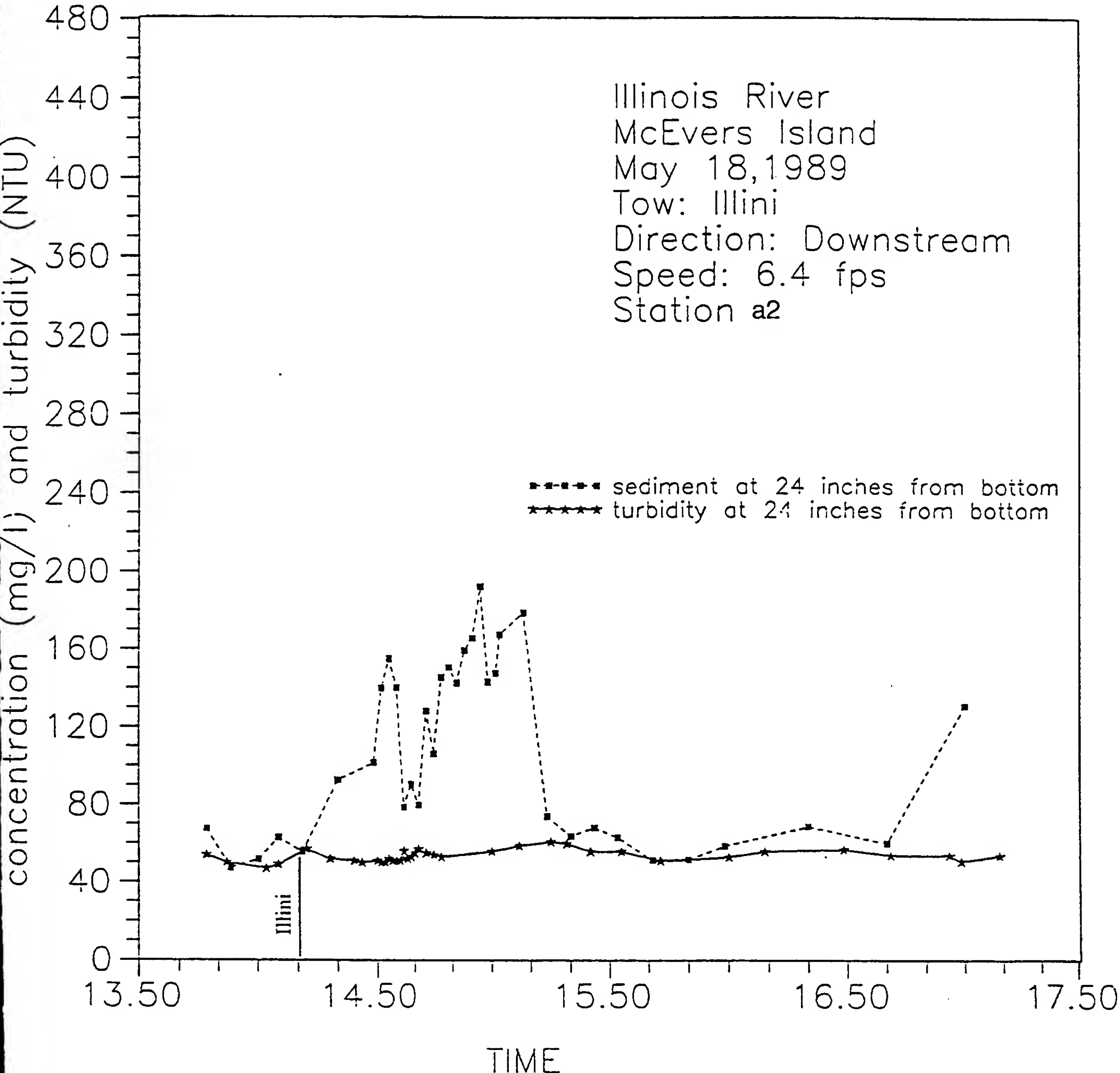
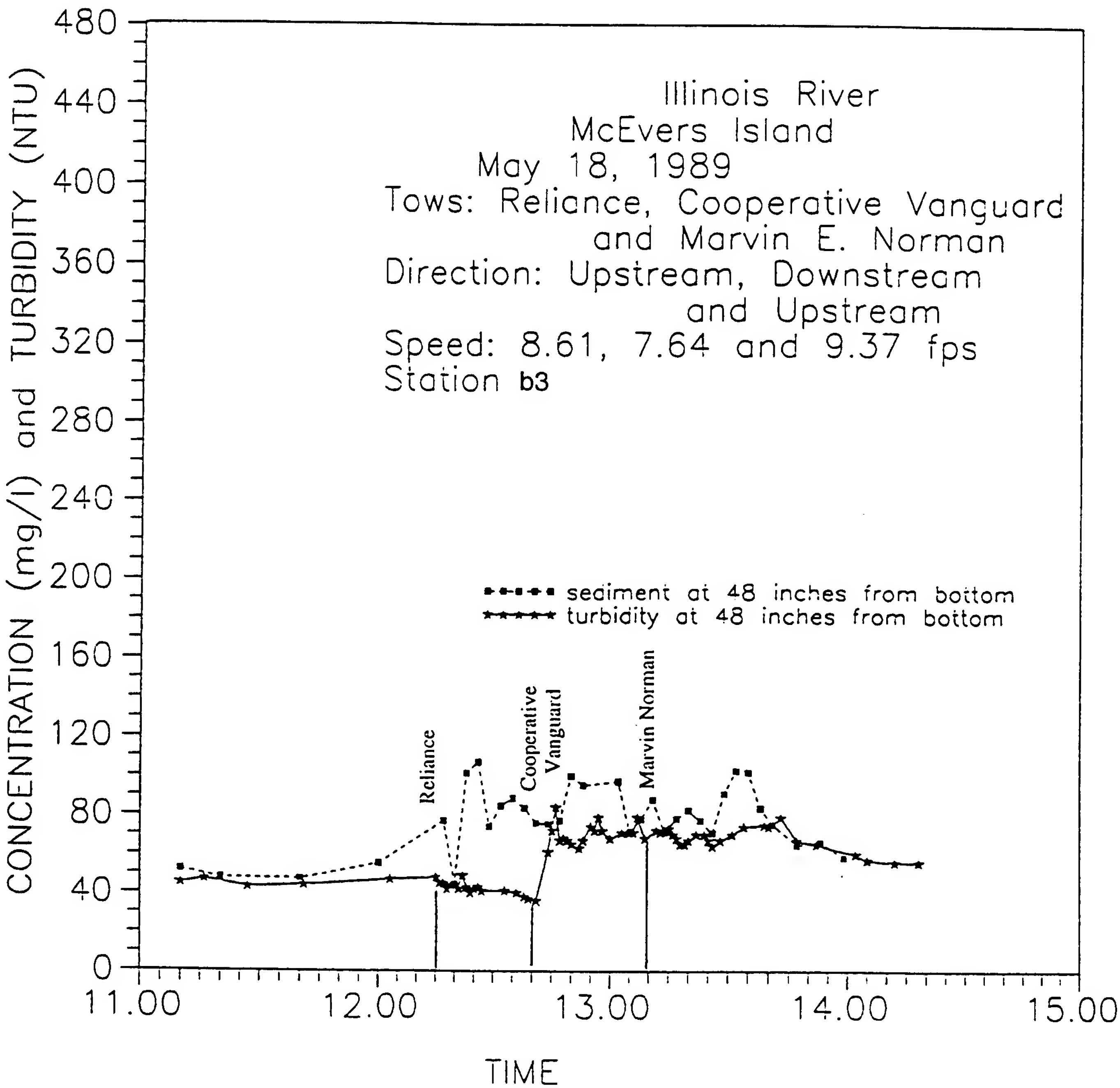


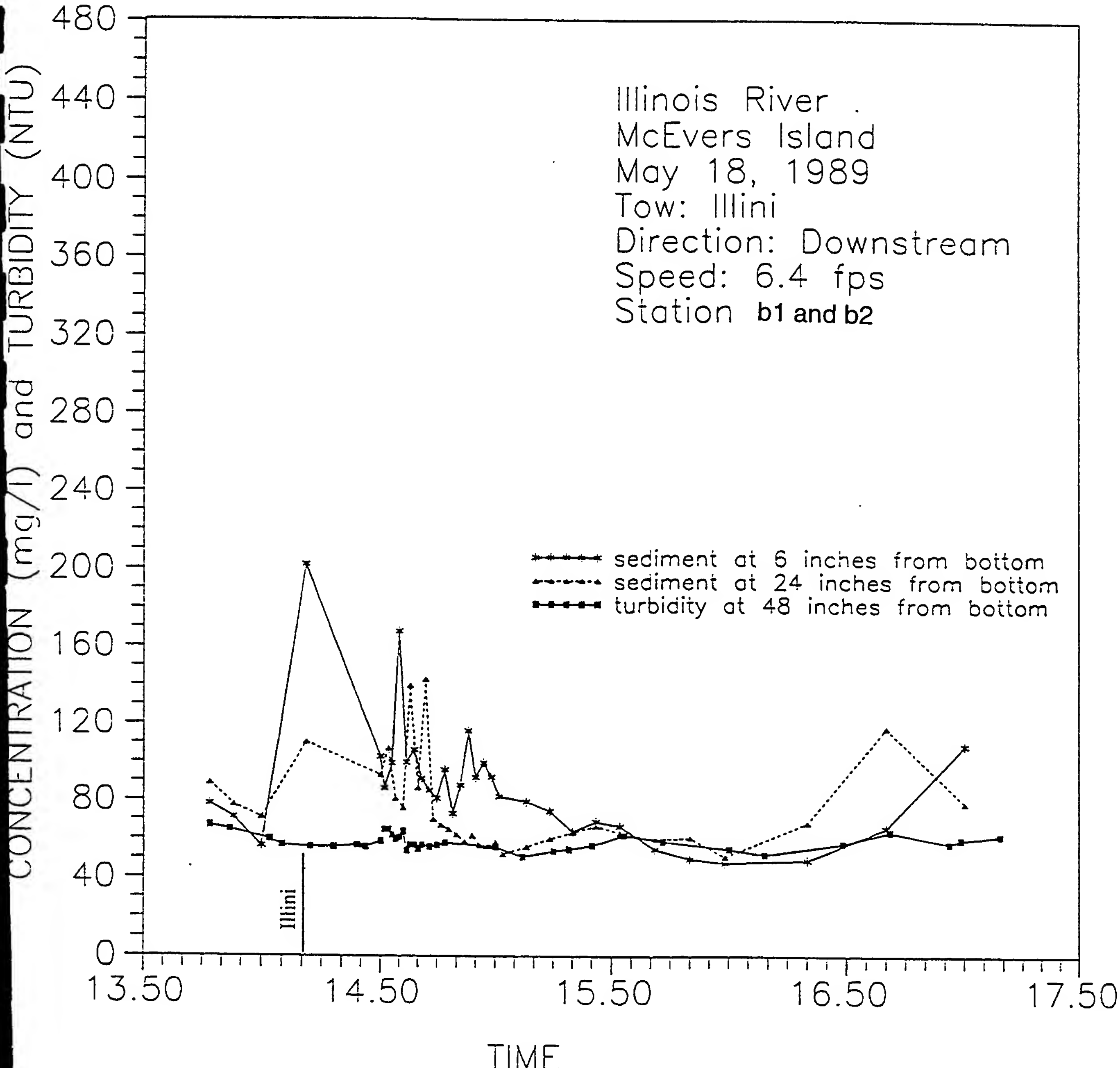
XXVIII-1. Comparison of turbidity and suspended sediment concentration at station a2, 11:00 a.m. to 3:00 p.m., May 18, 1989



XXVIII-2. Comparison of turbidity and suspended sediment concentration at station a2, 1:50 p.m. to 5:50 p.m., May 18, 1989



XXVIII-3. Comparison of turbidity and suspended sediment concentration at station b3, 11:00 a.m. to 3:00 p.m., May 18, 1989



XXVIII-4. Comparison of turbidity and suspended sediment concentration at station b1 and b2, 1:50 p.m. to 5:50 p.m., May 18, 1989

APPENDIX XXIX.

SUSPENDED SEDIMENT PARTICLE SIZE DISTRIBUTION

List of Suspended Sediment Particles Analyzed,
Goose Island, Trip 1

Date	Time	*Intake station*	*Dry weight, g*	*Lab No.*
08/24/90	12:42 - 12:53	a1	1.9958	379
	12:42 - 12:53	b1	1.9637	380
	12:42 - 12:53	b2	2.0393	381
	12:42 - 12:53	c1	1.8865	382
	12:42 - 12:53	c2	2.0263	383
08/25/90	10:21 - 10:34	a1	2.1207	384
	10:21 - 10:38	b1	1.7704	385
	10:21 - 10:32	c1	2.1242	386
	15:29 - 15:43	a1	1.2947	387
	15:29 - 15:39	b1	1.2450	388
	15:29 - 15:39	c1	1.6579	389
08/26/90	09:48-09:58	a1	1.9601	390
	09:48-10:03	b1	1.3911	391
	09:48-10:03	c1	1.7110	392
08/27/90	11:56-12:05	a1	1.7031	395
	11:53-12:04	b1	2.5421	396
	11:55-12:06	c1	1.88051	397

(During Barge-Tow Passage)

Date	*Time*	*Barge*	*Intake station*	*Dry weight, g*	*Lab No.*
08/26/90	11:44 - 11:56	K. Michael	a1	1.1636	393
	13:26 - 13:35	Sumac	b1	0.6856	394

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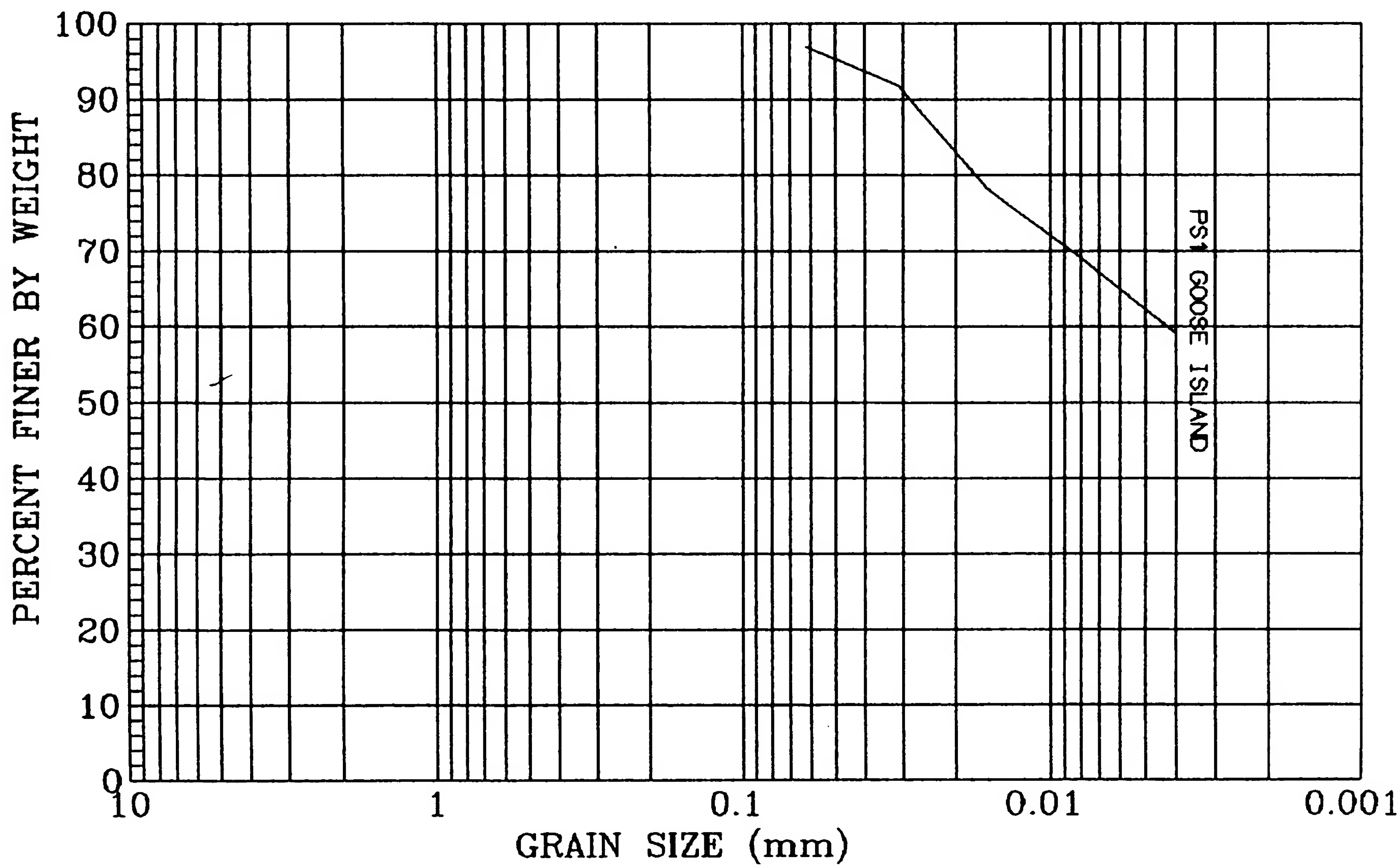
LAB. NO. 379

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

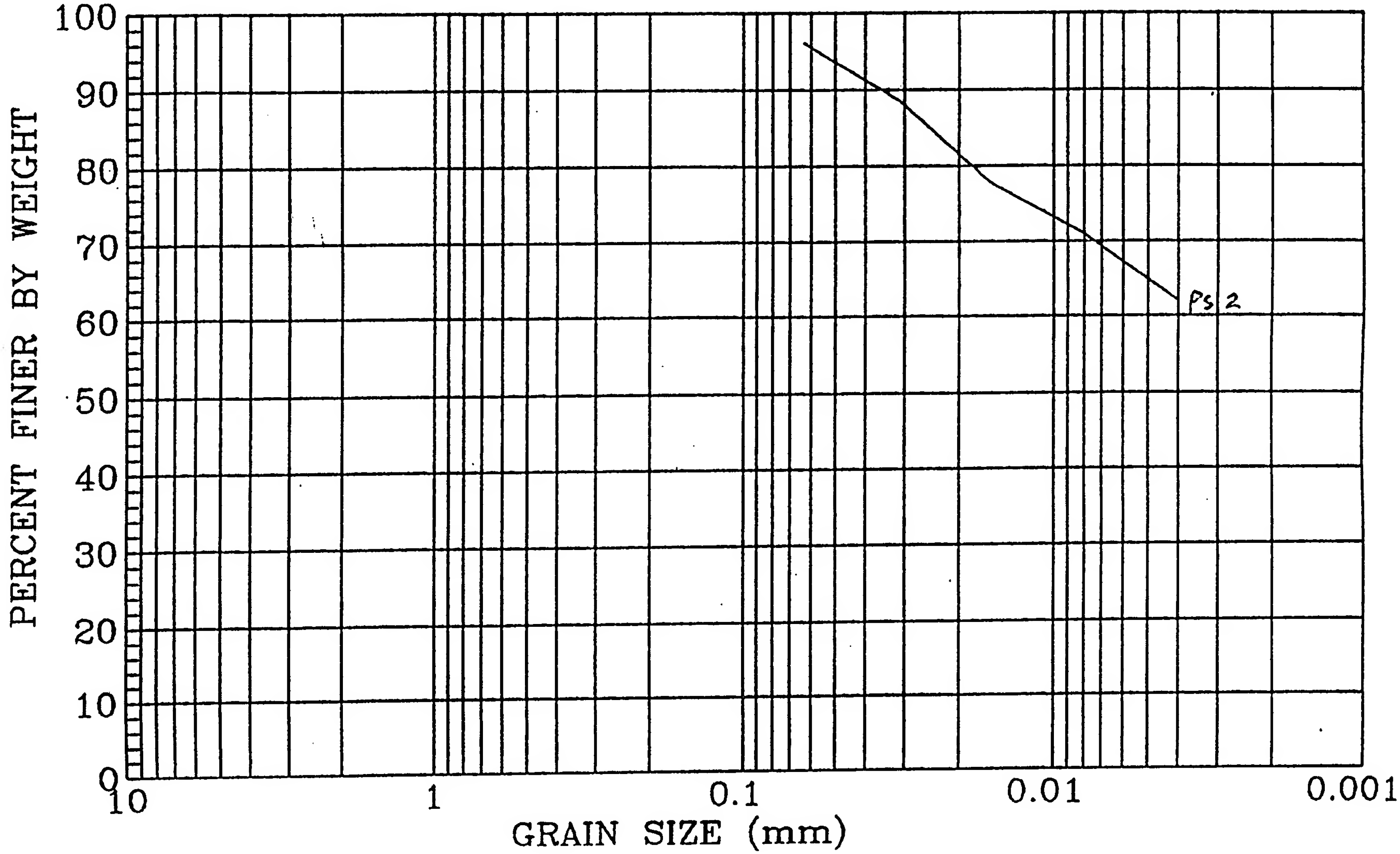
SAMPLE ID:GOOSE ISLAND
DATE:08/90
TIME:1242–1253
STATION:1A 9 FROM BOTTOM
PROJECT:NAVIGATION IMPACT
COMMENTS:



LAB. NO. 380

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

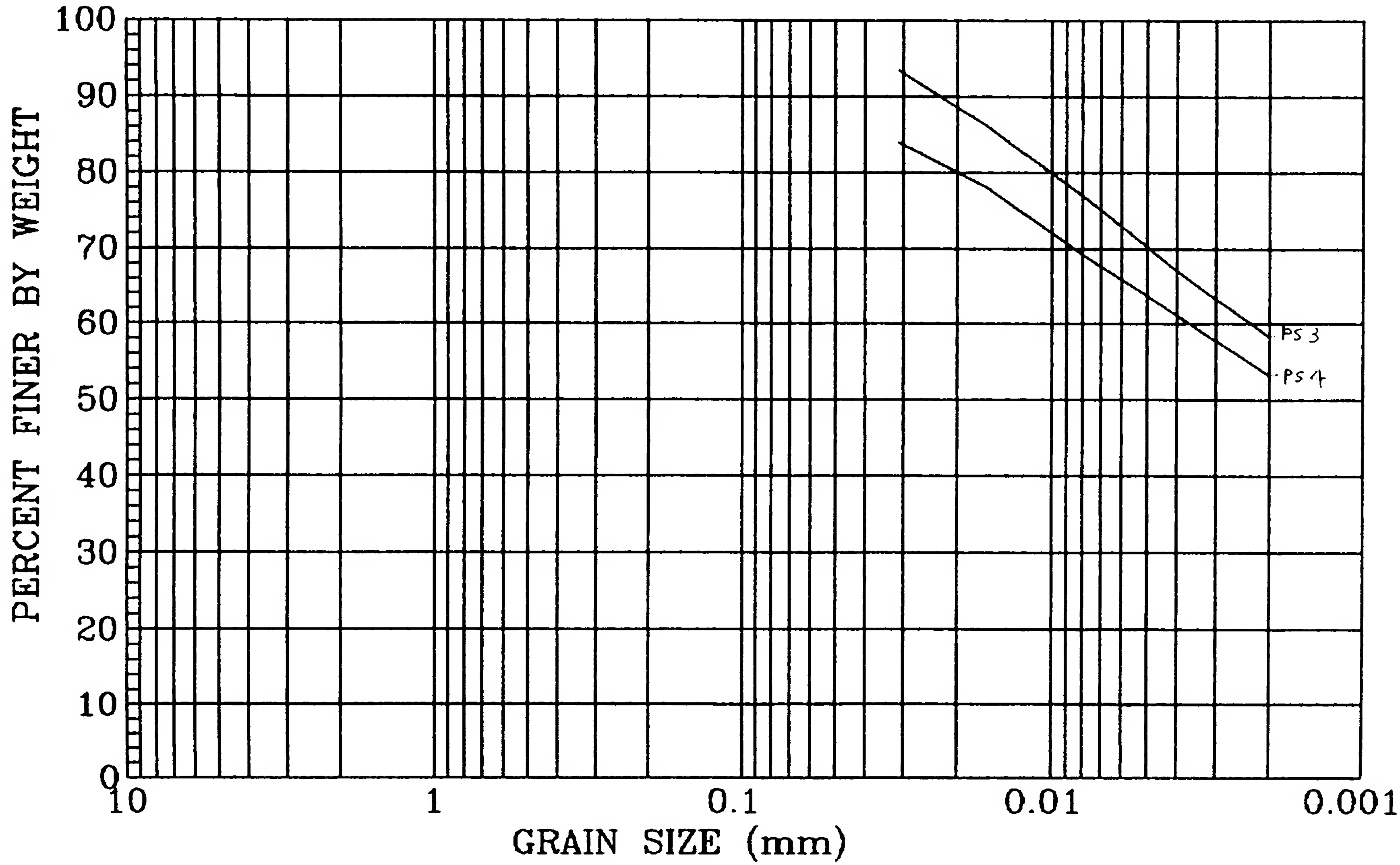
SAMPLE ID:GOOSE ISLAND
DATE:08/90
TIME:1242–1253
STATION:2A 9 FROME BOTTOM
PROJECT:NAVIGATION IMPACT
COMMENTS:



LAB. NO. 381
LAB. NO. 382

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

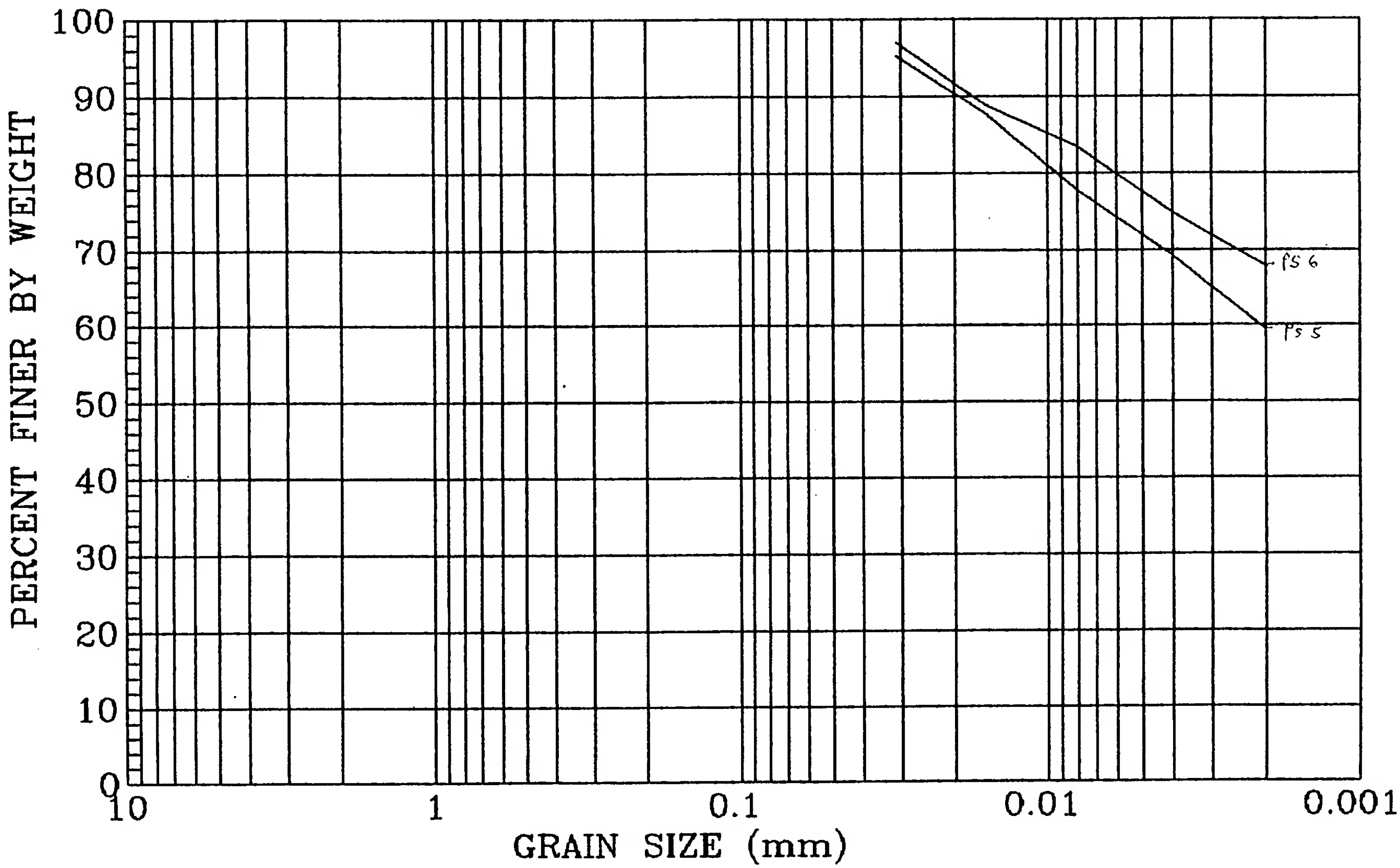
PROJECT: NAVIGATION IMPACT
ANALYSIS DATE:04/29/94
COLLECTED DATE:08/24/90
TIME: PS3(1242–1251) PS4(1240–1254)
SITE: GOOSE ISLAND
COMMENTS:



LAB. NO. 383
LAB. NO. 384

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

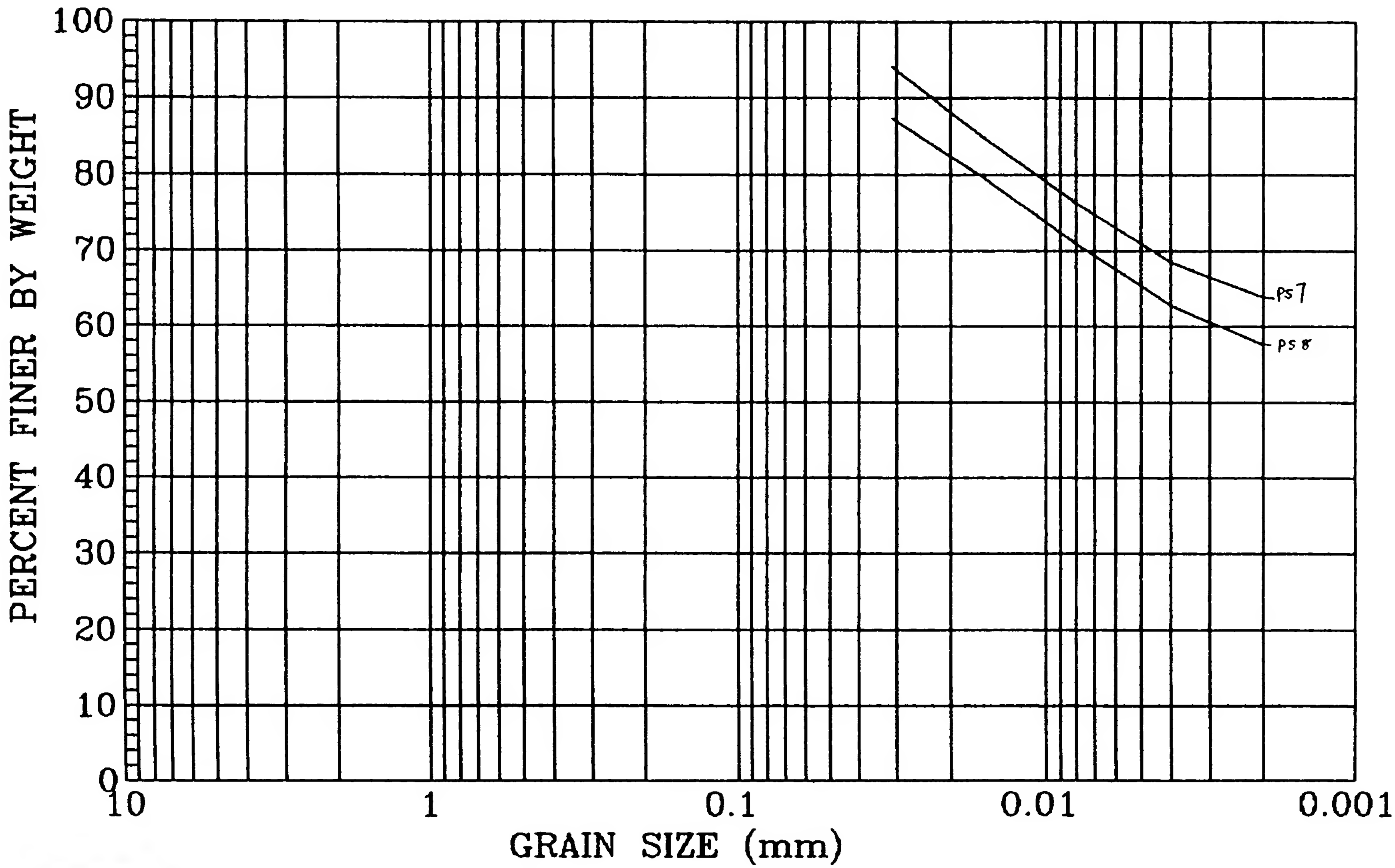
PROJECT: navigation impact
ANALYSIS DATE: 04/29/94
COLLECTED DATE: 08/24/90
TIME: ps5(1240-1253) ps6(1021-1034)
SITE: goose island
COMMENTS:



LAB. NO. 385
LAB. NO. 386

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

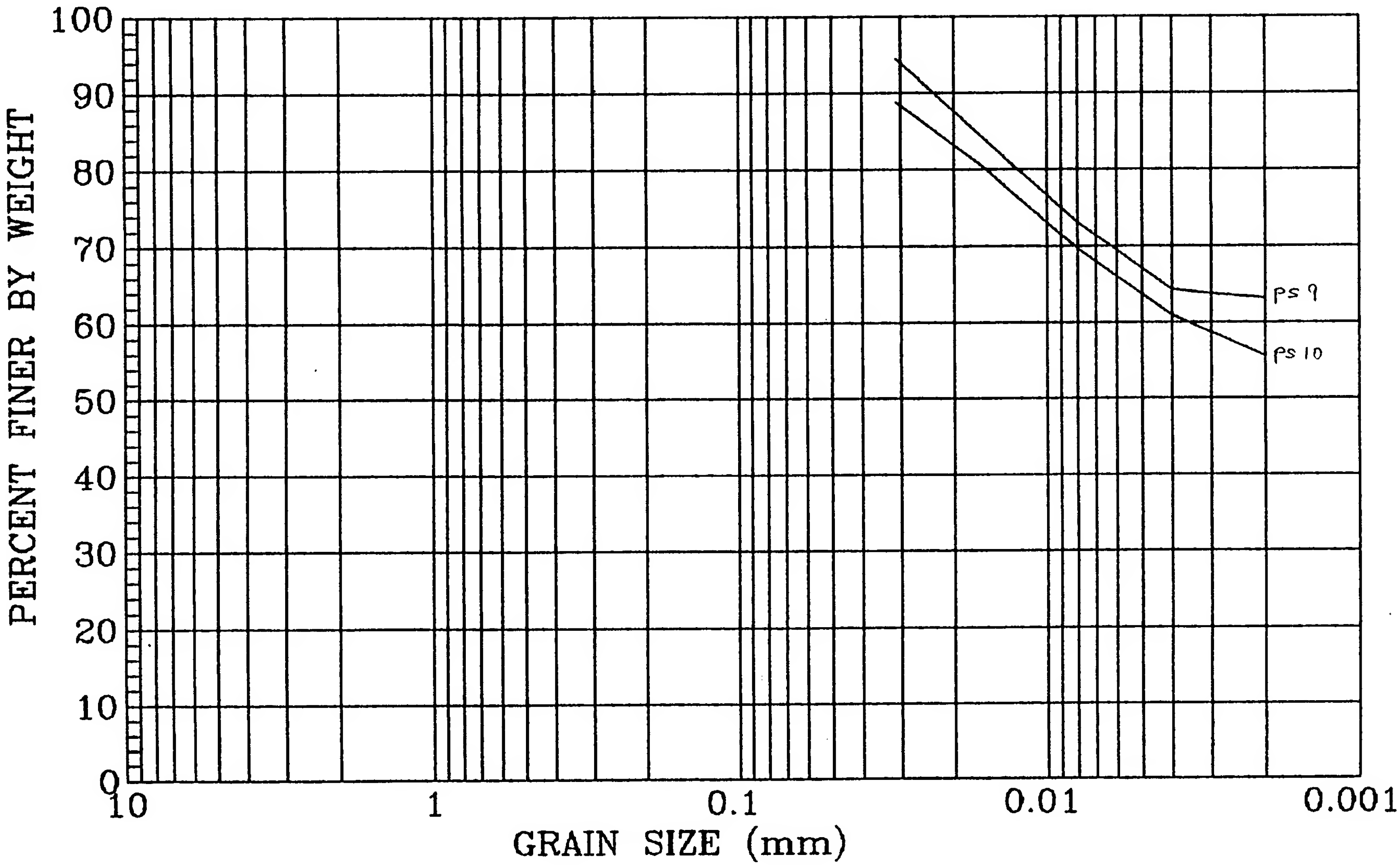
PROJECT: navigation impact
ANALYSIS DATE: 04/29/94
COLLECTED DATE: 08/24/90
TIME: ps7(1021-1038) ps8(1021-1032)
SITE: goose island
COMMENTS:



LAB. NO. 387
LAB. NO. 388

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

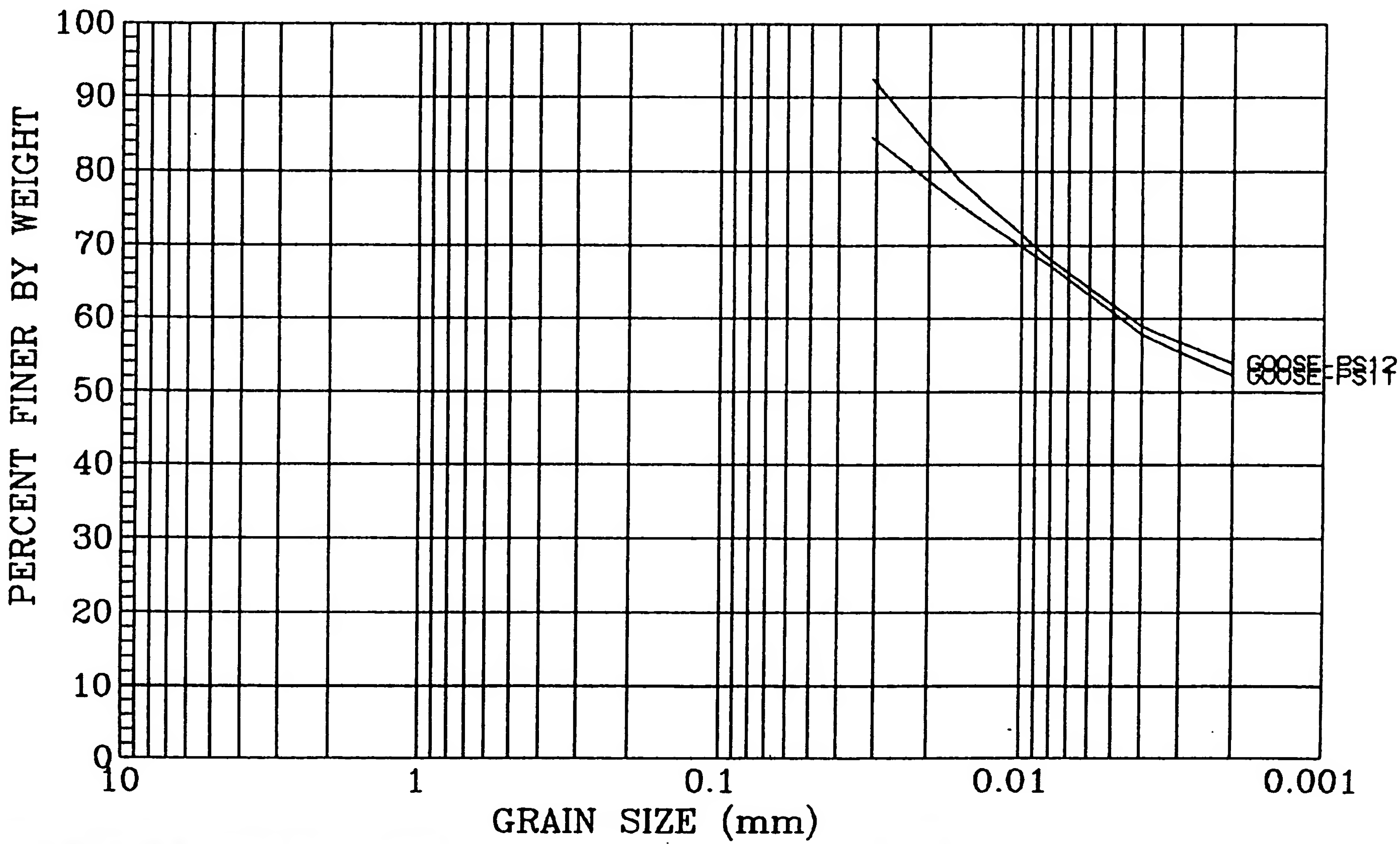
PROJECT: navigation impact
ANALYSIS DATE: 04/94
COLLECTED DATE: 08/25/90
TIME: ps9(1529-1539) PS10(1529-1543)
SITE: goose island
COMMENTS:



LAB. NO. 389
LAB. NO. 390

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

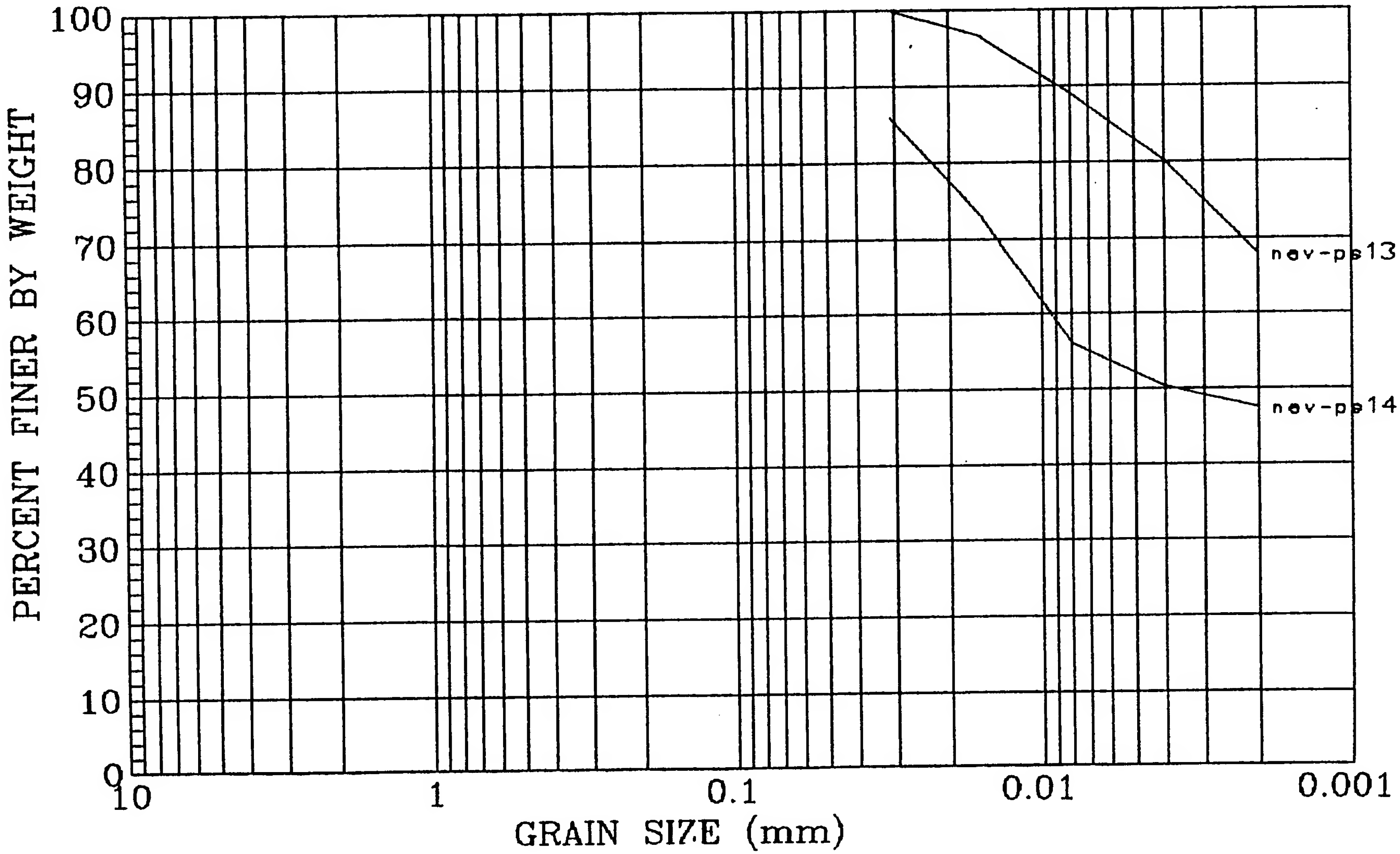
PROJECT: navigation impact
ANALYSIS DATE: 04/94
COLLECTED DATE: 08/25/90
TIME: ps11(1529-1539) ps12(948-958)
SITE: goose island
COMMENTS:



LAB. NO. 392

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

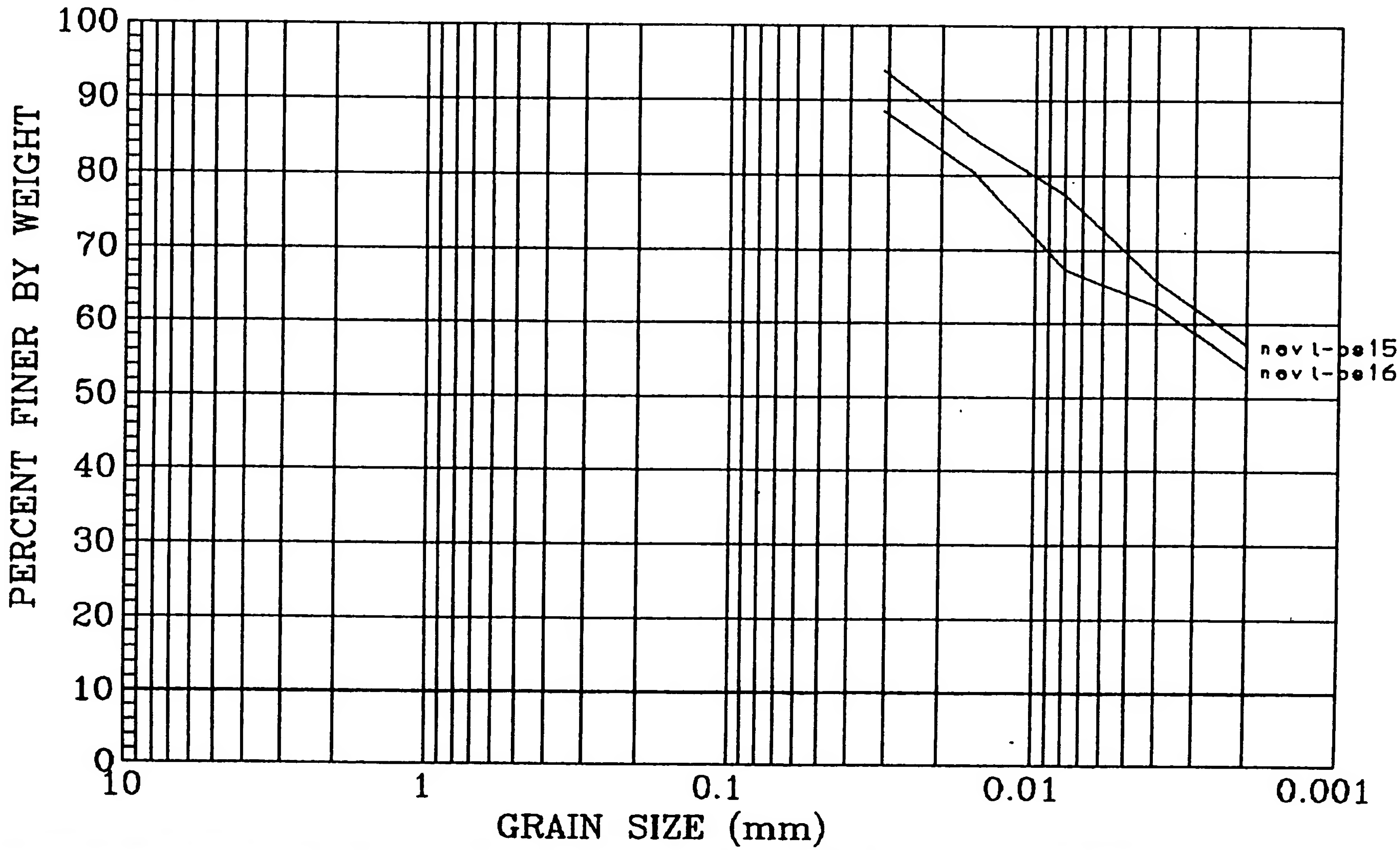
PROJECT: navigation impact
ANALYSIS DATE: 08/31/94
COLLECTED DATE: 08/26/90
TIME: ps13(948-1003) ps14(948-1003)
SITE: goose island
COMMENTS:



LAB. NO. 393
LAB. NO. 394

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

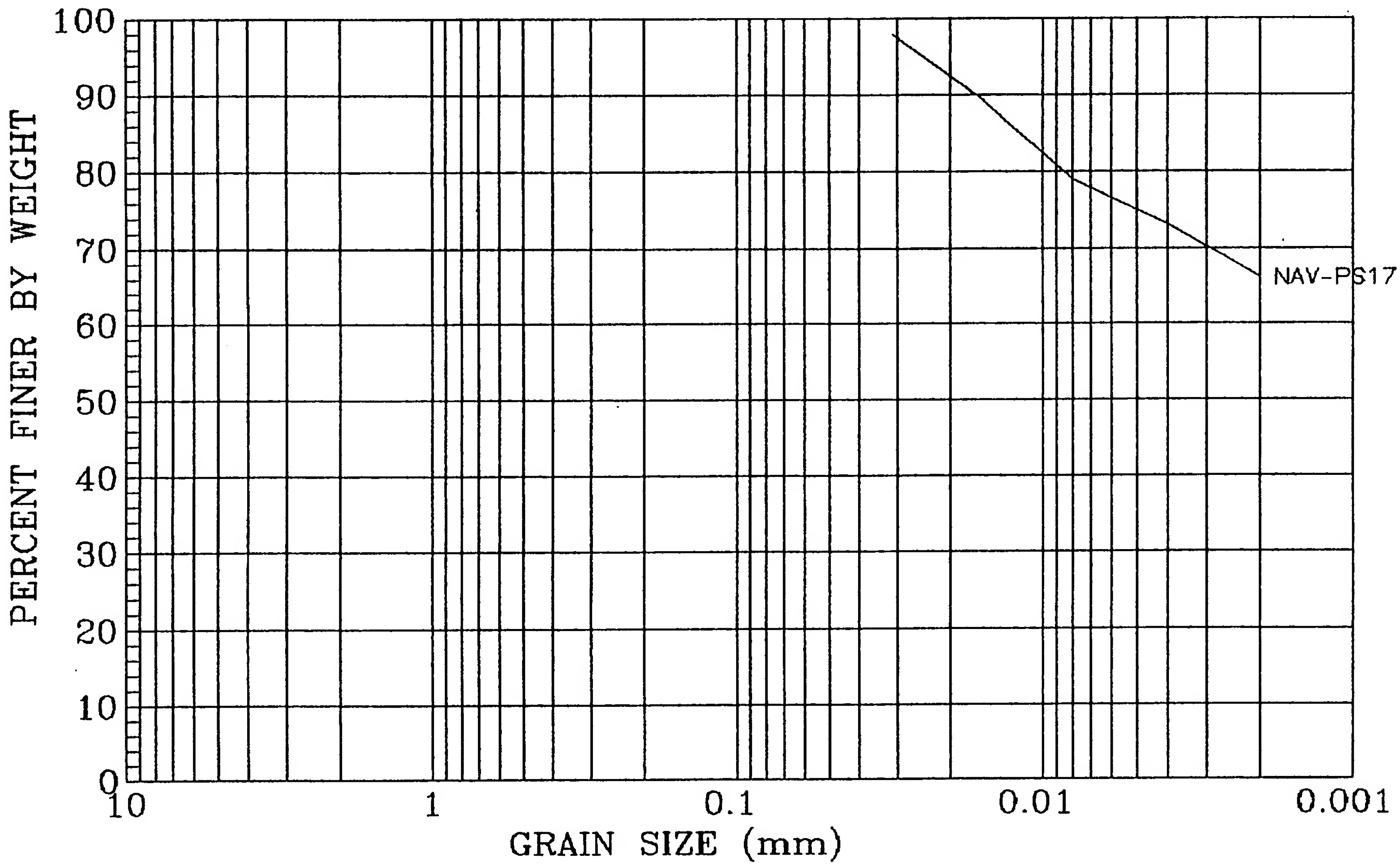
PROJECT: navigation impact
ANALYSIS DATE: 08/31/94
COLLECTED DATE: 08/26/90
TIME: ps15(1144-1156) ps16(1326-1335)
SITE: goose island
COMMENTS:



LAB. NO. 395

PROJECT: navigation impact
ANALYSIS DATE: 09/28/94
COLLECTED DATE: 08/27/90
TIME: 1156–1205
SITE:goose island.background
COMMENTS:1 A 9"from bottom

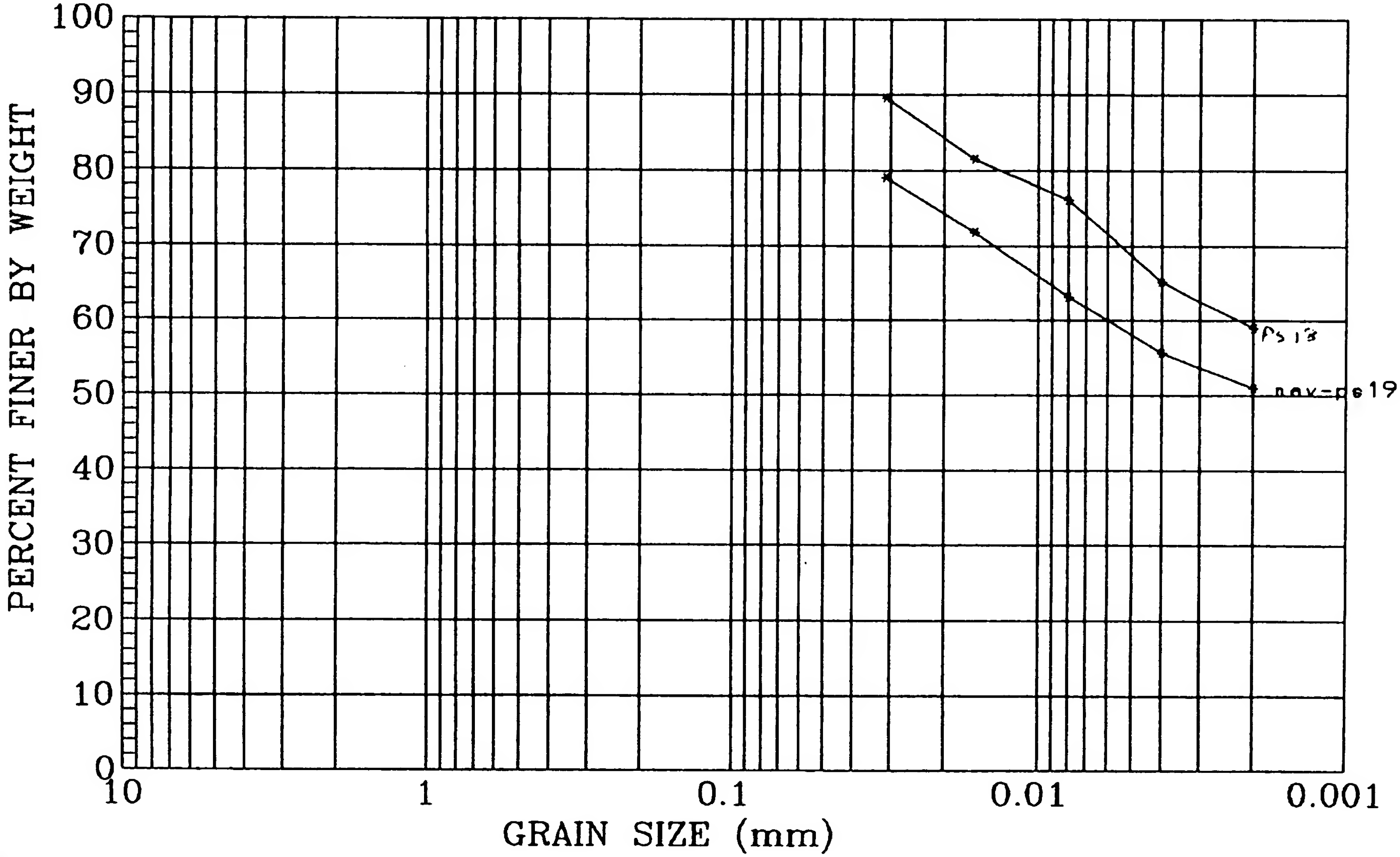
ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY



LAB. NO. 396
LAB. NO. 397

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 08/27/90
TIME: ps18(1153-1204)ps19(1155-1206)
SITE: goose island.backgrond
COMMENTS:ps18(2 A 9"from bottom
ps19(3 A 9"from bottom



List of Suspended Sediment Particles Analyzed, Goose Island, Trip 2

Date	*Time*	*Intake station*	*Dry weight, g*	*Lab No.*
07/22/91	14:38 - 14:45	d2	0.9599	408
	15:00 - 1509	b1	0.8878	403
	15:00 - 1507	b2	0.8878	404
	15:00 - 1509	e1	0.8180	411
	16:36 - 16:42	d1	0.9958	406
	16:37 - 16:42	d2	1.1943	409
	16:50 - 16:59	b1	1.1237	400
	16:50 - 16:57	b2	0.9955	401
	17:10 - ?	d1	0.833	414
07/23/91	11:31 - 11:39	b1	0.8299	399
	11:45 - ?	d1	0.7915	416
	11:45 - ?	d2	0.8089	410
	11:45 - ?	e1	0.8180	412

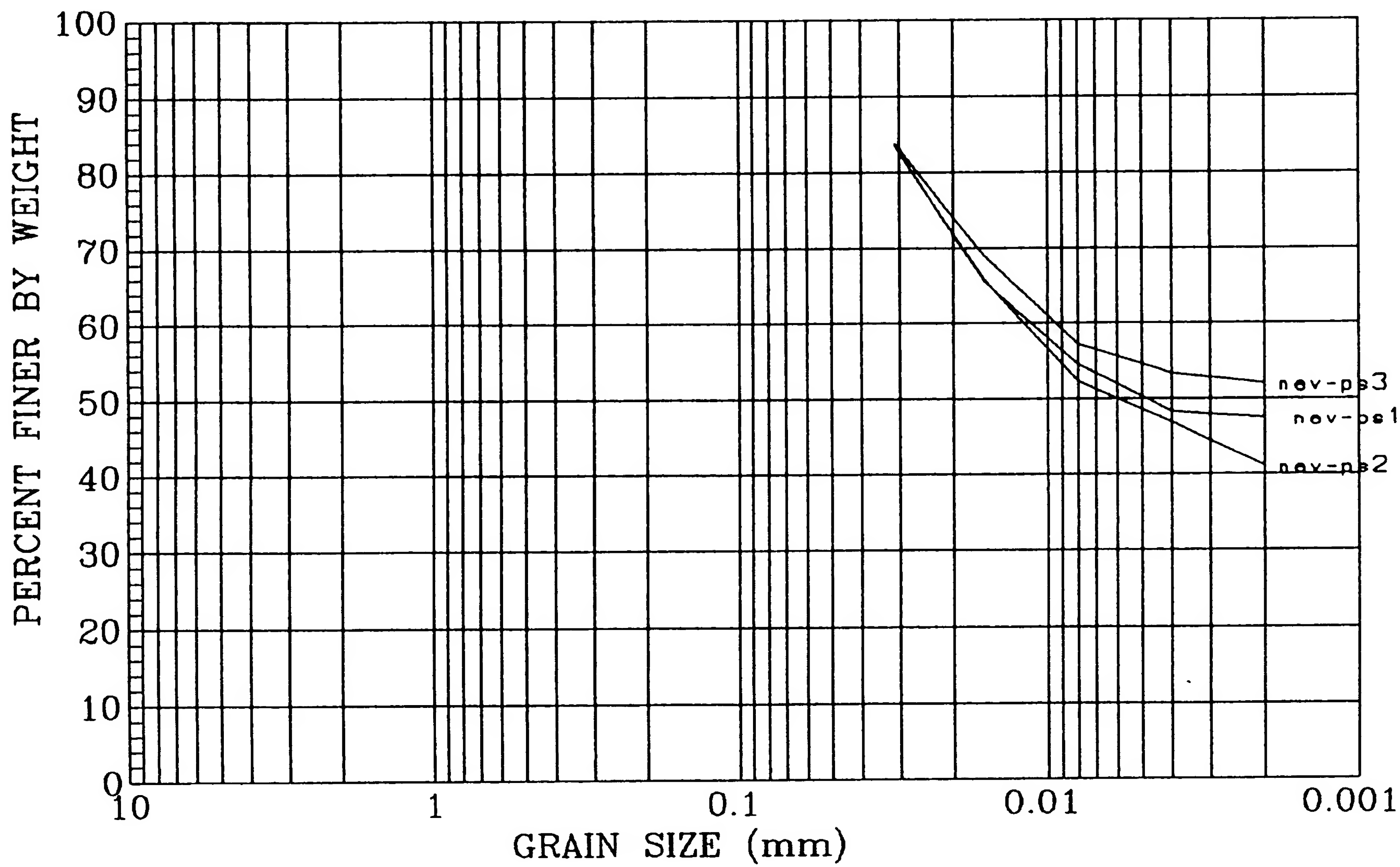
(During Barge-Tow Passage)

Date	*Time*	*Barge*	*Intake station*	*Dry weight, g*	*Lab No.*
07/23/91	16:25 - ?	Evey - T	b1	1.1077	398
	16:25 - ?		b2	1.2544	405
	16:30 - ?		d1	0.7705	417
	16:30 - ?		d2	1.0641	415
	16:30 - ?		e1	0.6456	413

LAB. NO. 398
LAB. NO. 399
LAB. NO. 400

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

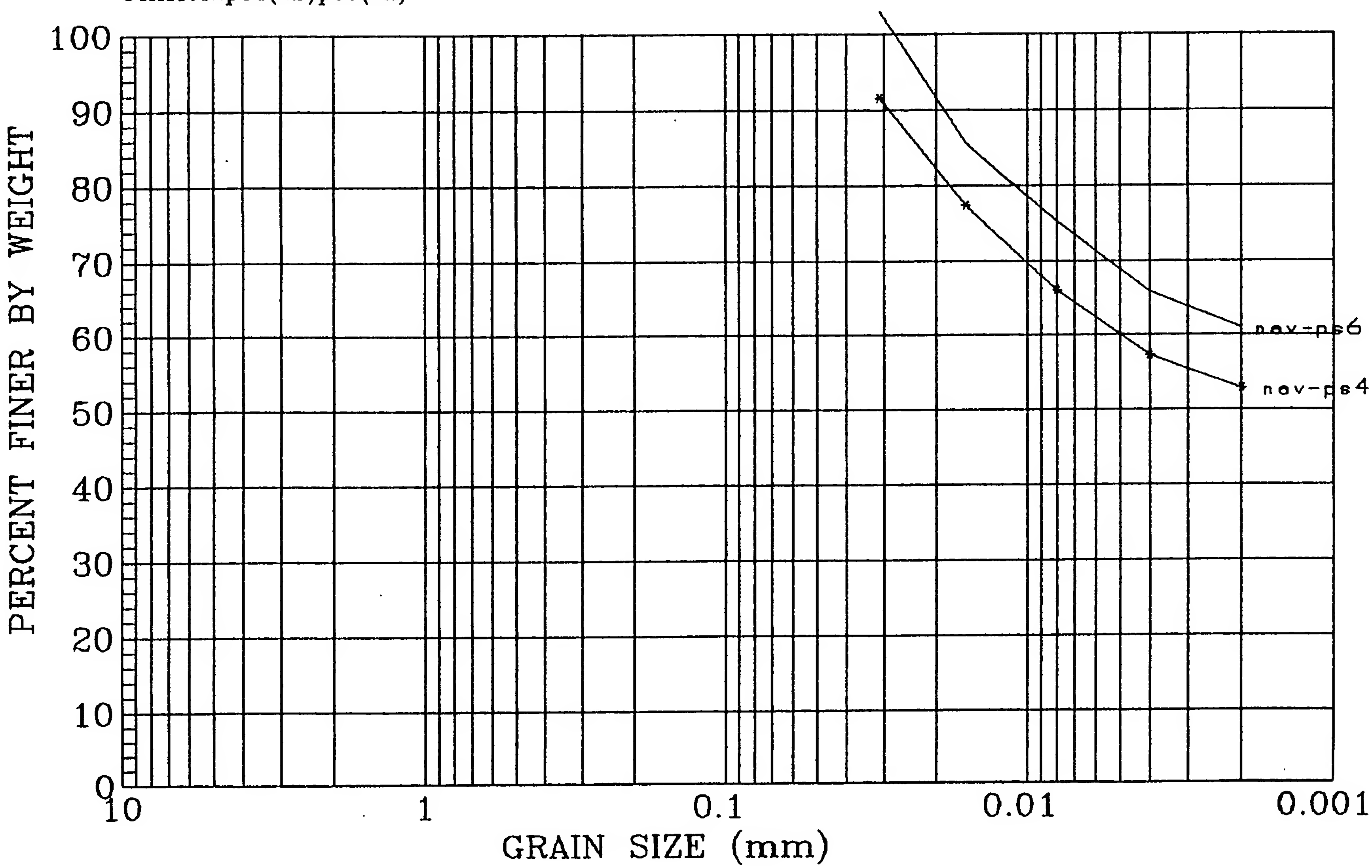
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/23/91
TIME: ps1(1625)ps2(1131–1139)
SITE:goose island.station 2A
COMMENTS: ps3(1650–1659)



LAB. NO. 401
LAB. NO. 403

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

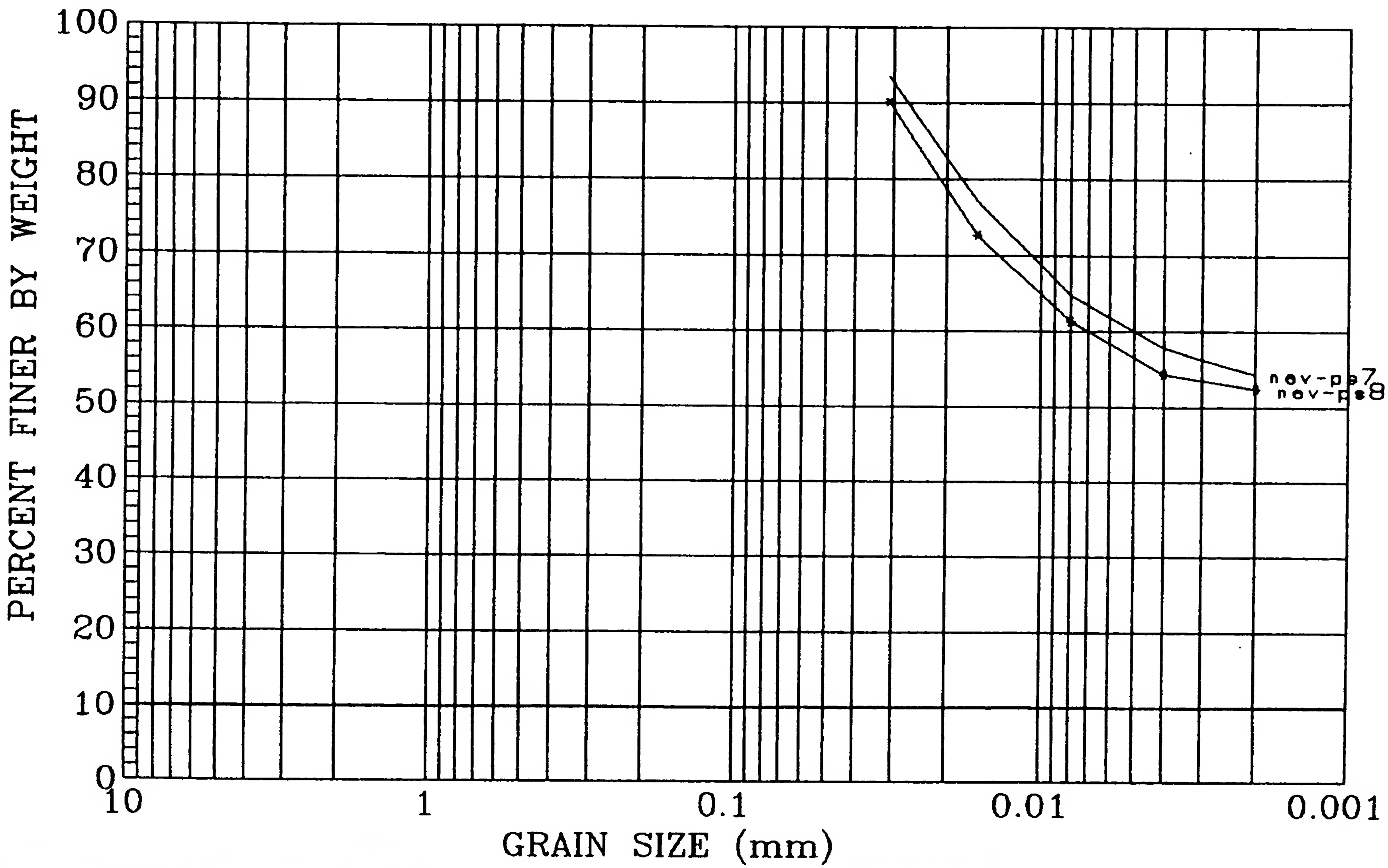
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/22/91
TIME:ps4(1650-1657)ps6(1500-1509)
SITE: goose island
STATION:ps4(2B)ps6(2A)



LAB. NO. 404
LAB. NO. 405

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

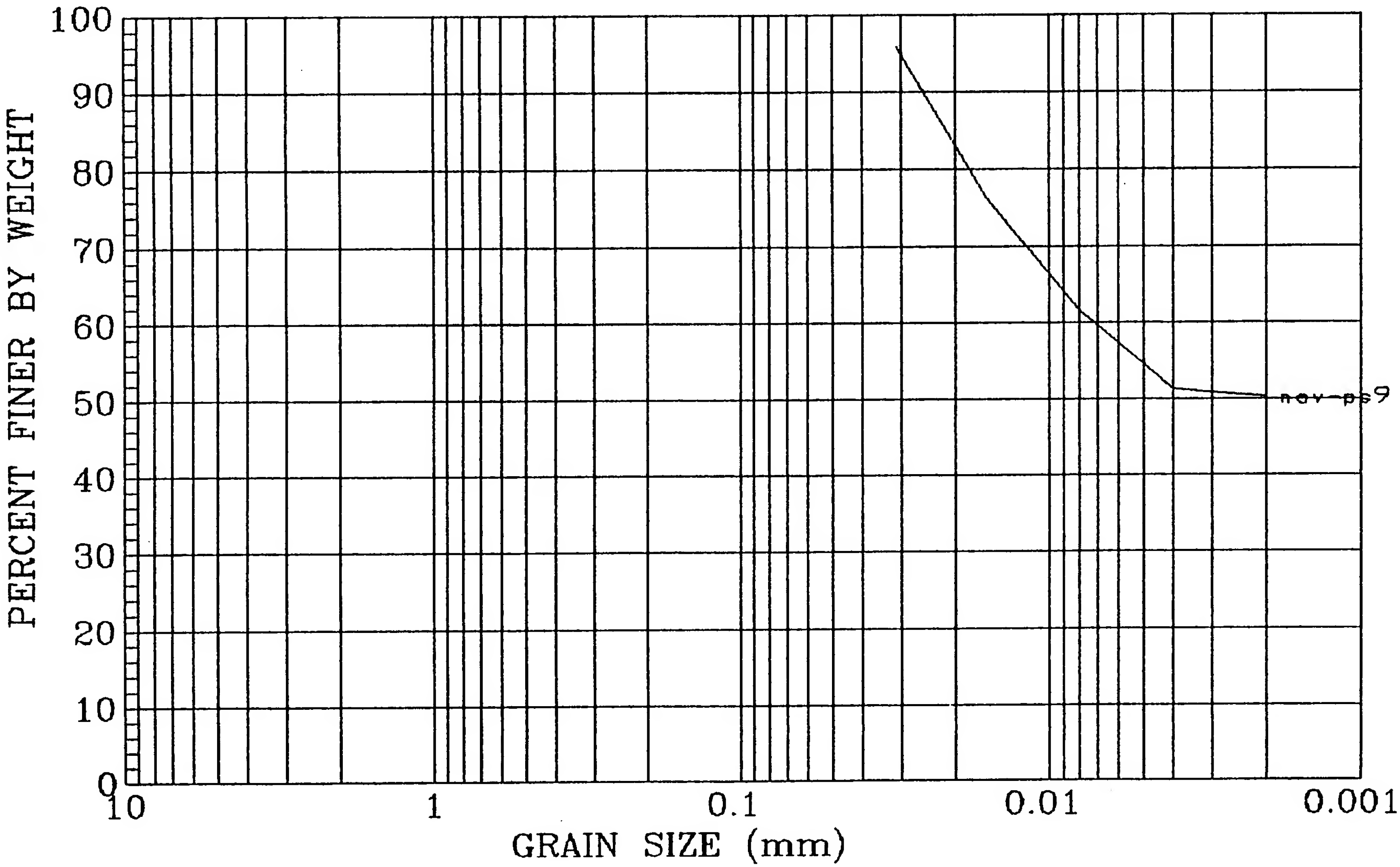
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/22.23./91
TIME: ps7(1500–1507)ps8(1625)
SITE: goose island
STATION: 2B



LAB. NO. 406

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

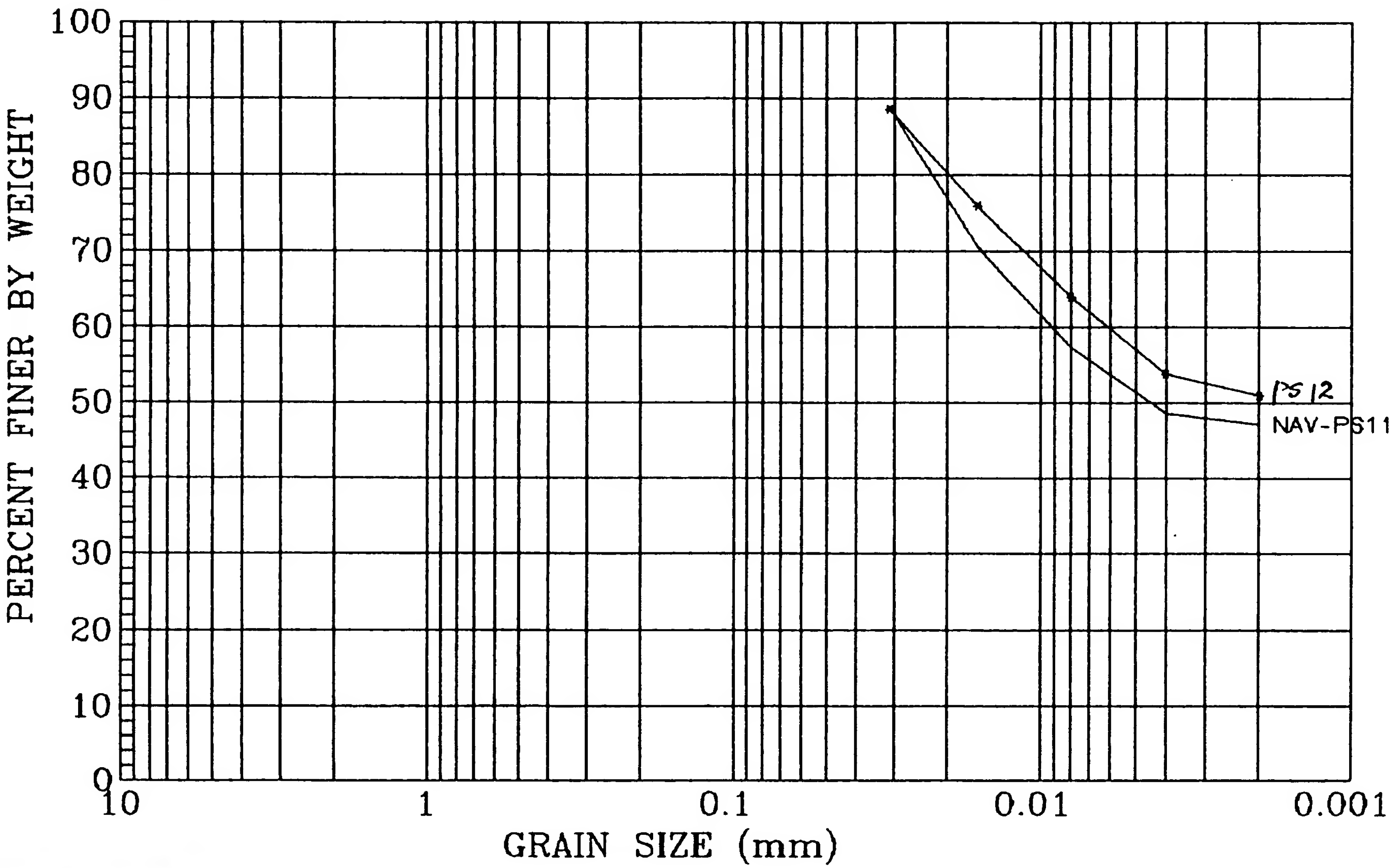
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/22/91
TIME: ps9(1636)
SITE:goose island.station 4 A
COMMENTS:



LAB. NO. 408
LAB. NO. 409

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

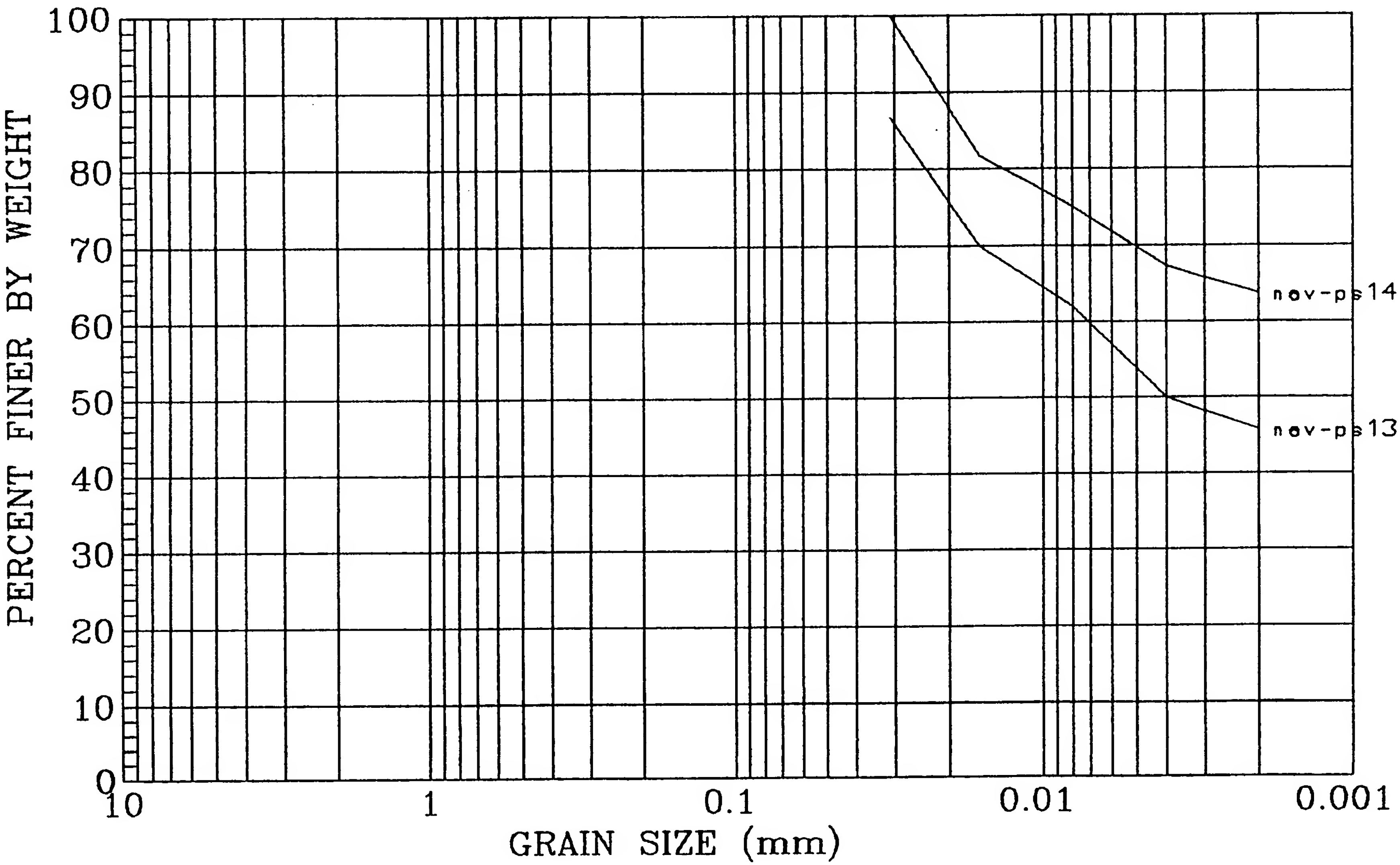
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE:07/22/91
TIME:PS11(1438-1445)PS12(1637-1642)
SITE: goose island.station 4 B
COMMENTS:



LAB. NO. 410
LAB. NO. 411

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

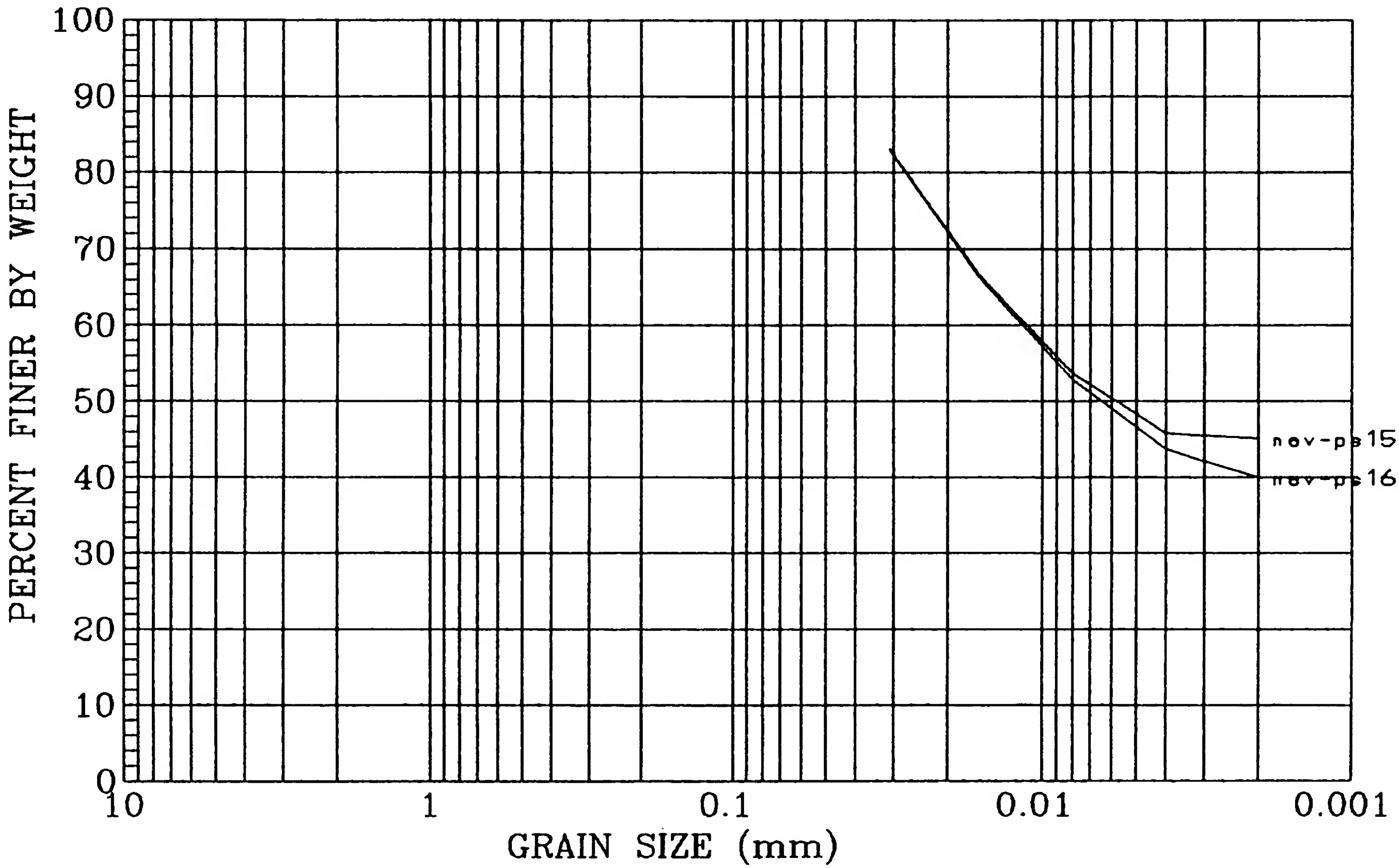
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/23/91
TIME:ps13(1145)ps14(1500)
SITE: goose island
STATION:PS13 4B.ps14 5?



LAB. NO. 412
LAB. NO. 413

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

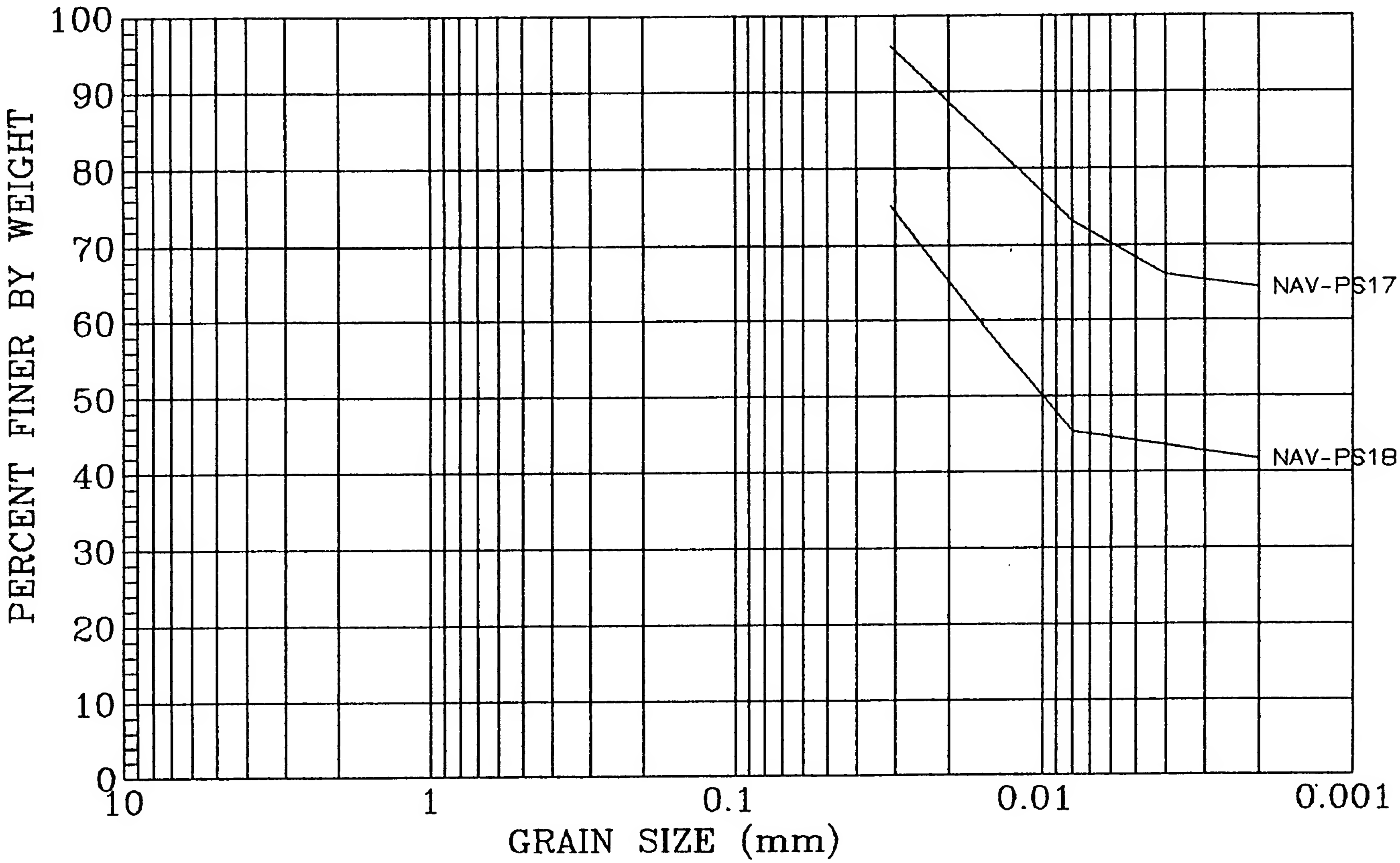
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/23/91
TIME: ps15(1145)ps16(1630)
SITE: goose island.
STATION:PS15 5A.PS16 5A



LAB. NO. 414
LAB. NO. 415

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

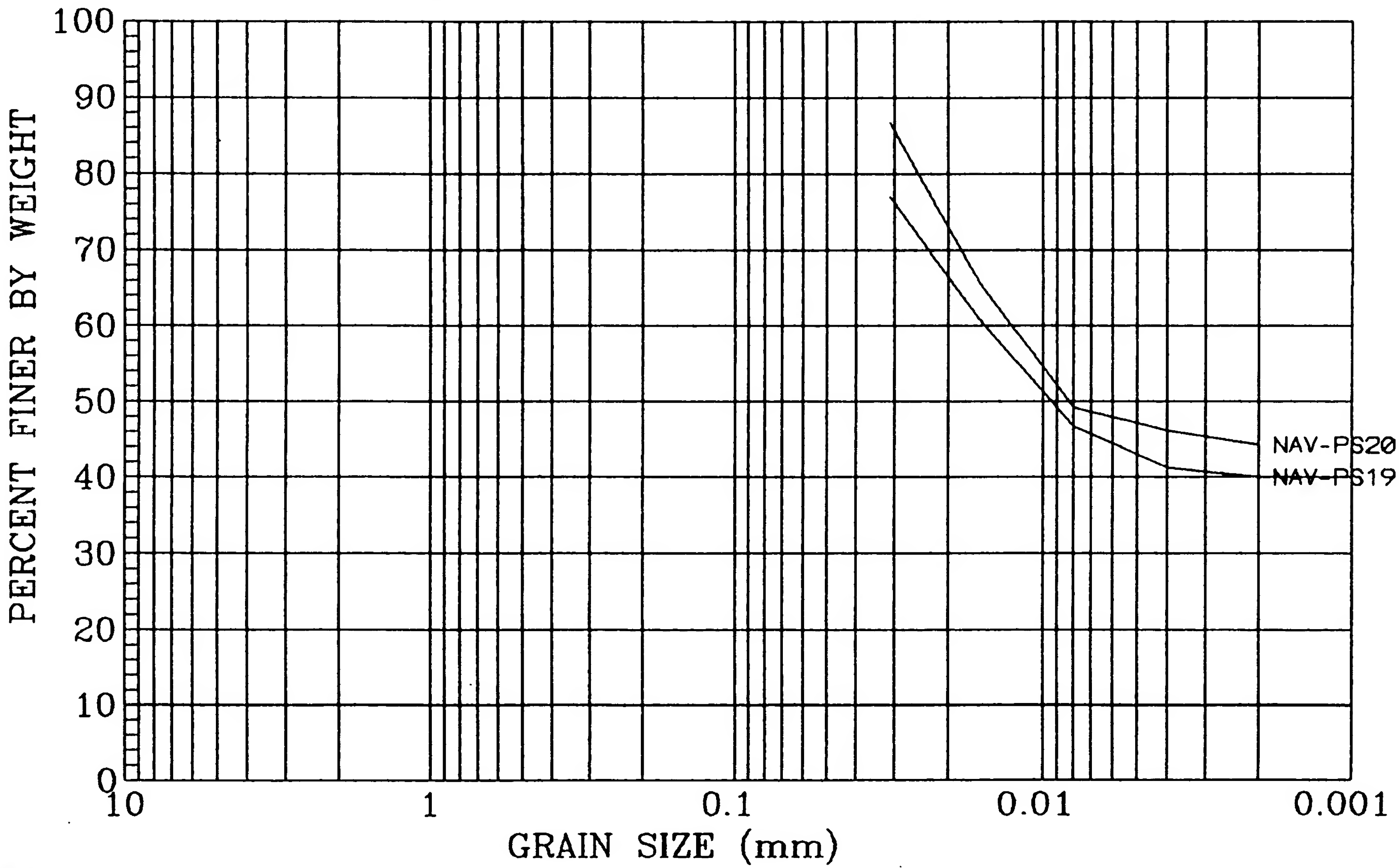
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 07/22/91
TIME: PS17(1710?)PS18(1630)
SITE: goose island
STATION:PS17 4A PS18 4B



LAB. NO. 416
LAB. NO. 417

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE:07/23/91
TIME: ps19(1145)ps20(1630)
SITE: goose island
STATION:PS19 4A PS20 4A



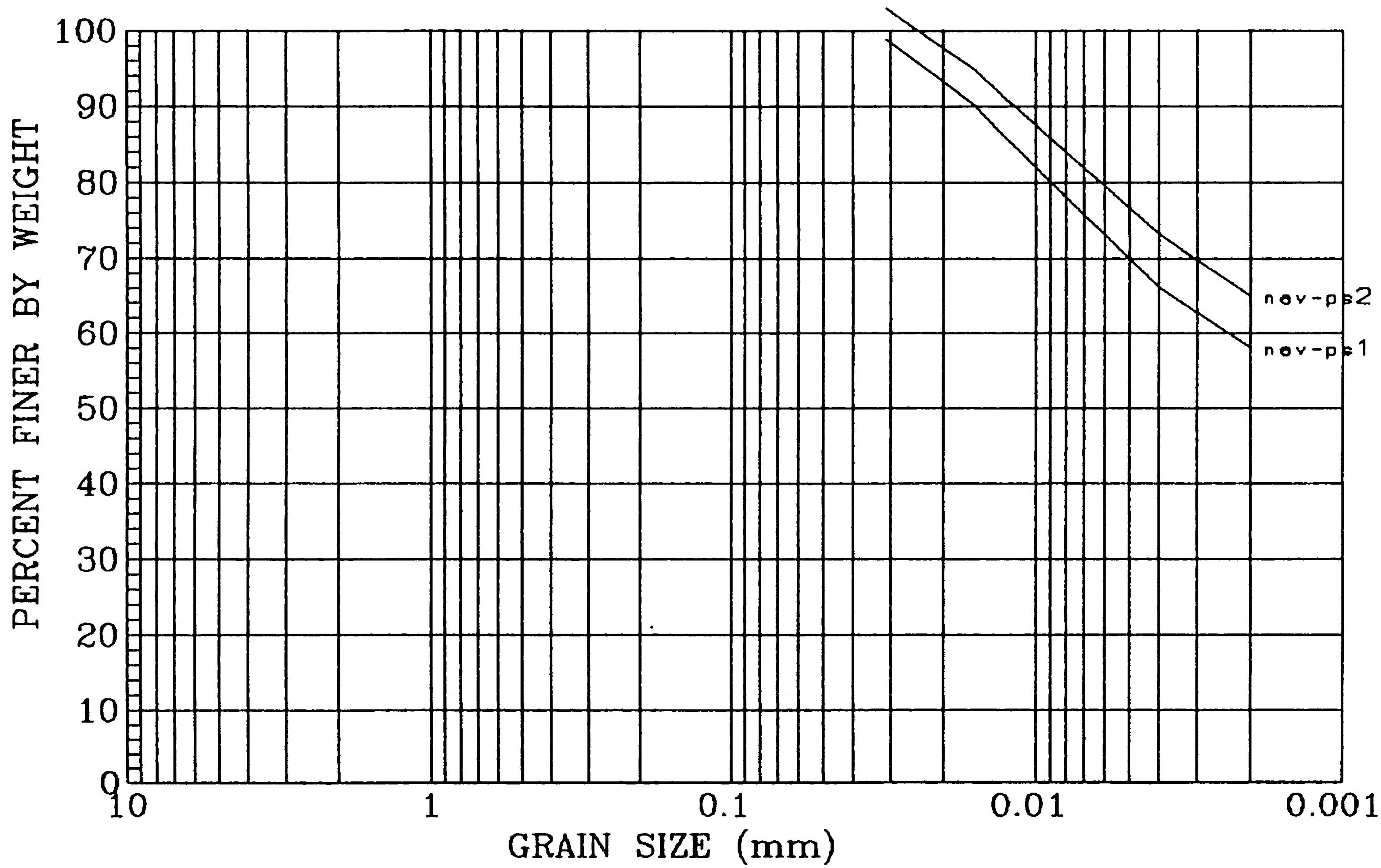
List of Suspended Sediment Particles Analyzed, Clarks Ferry, Trip 1

Date	*Time*	*Intake station*	*Dry weight, g*	*Lab No.*
05/18/91	11:19 - 11:28	a1	5.6440	418
	11:19 - 11:28	a2	5.4896	419
	11:19 - 11:28	b1	5.2359	420
	11:19 - 11:28	b2	5.2568	423
	11:19 - 11:28	b3	6.0134	424
05/20/91	16:30 - ?	b1	1.8645	421
	16:30 - ?	c2	1.6799	425
05/21/91	10:10 - 10:21	b1	1.4145	422
	10:10 - 10:21	c1	1.5863	426
	17:01 - 17:14	e1	2.9209	427
	17:01 - 17:14	e2	7.6477	428

LAB. NO. 418
LAB. NO. 419

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

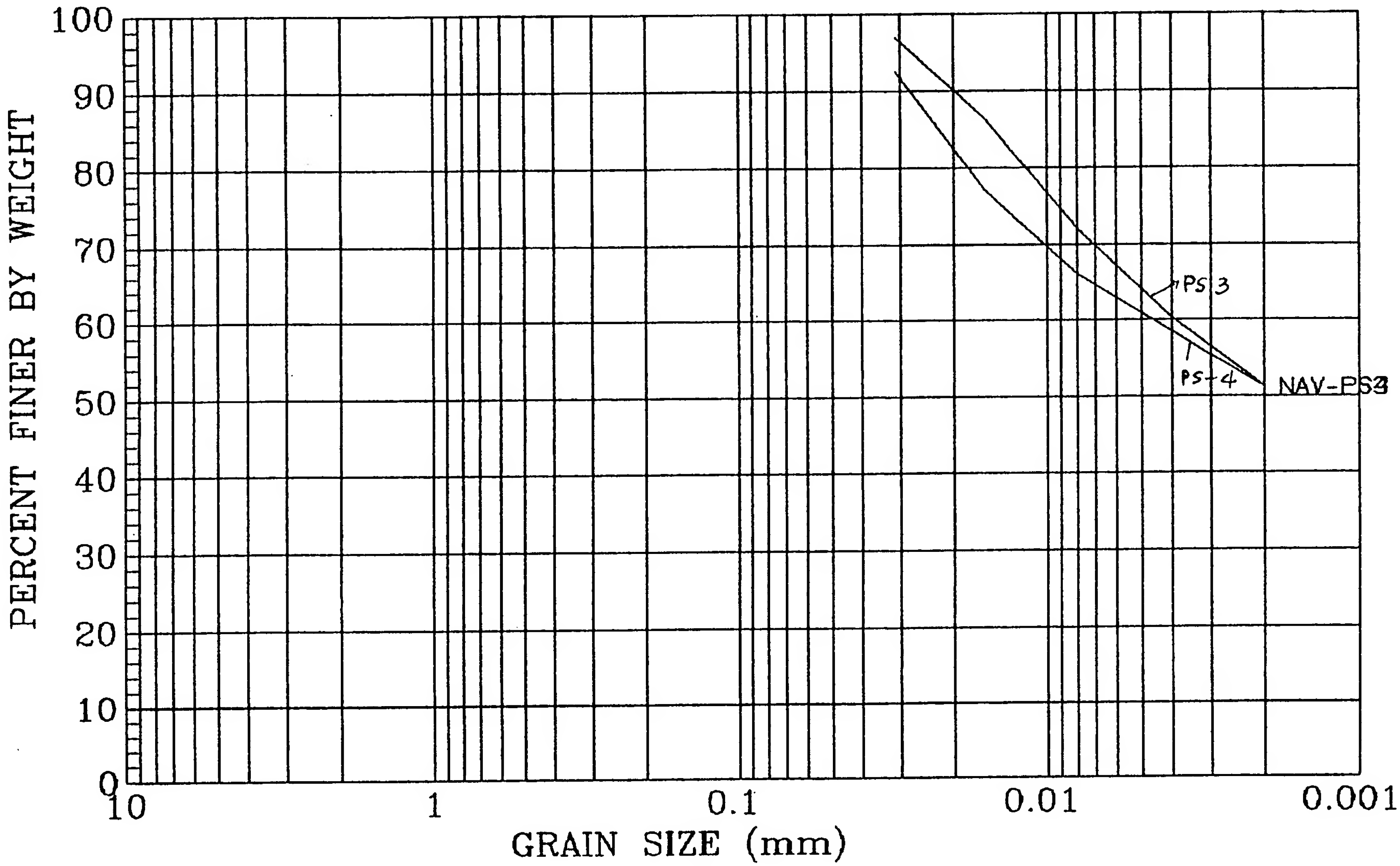
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 05/18/91
TIME: ps1(1119-1128)ps2(1119-1128)
SITE: clarks ferry
STATION:PS1(1A 12")PS2(1B 30")



LAB. NO. 420
LAB. NO. 421

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

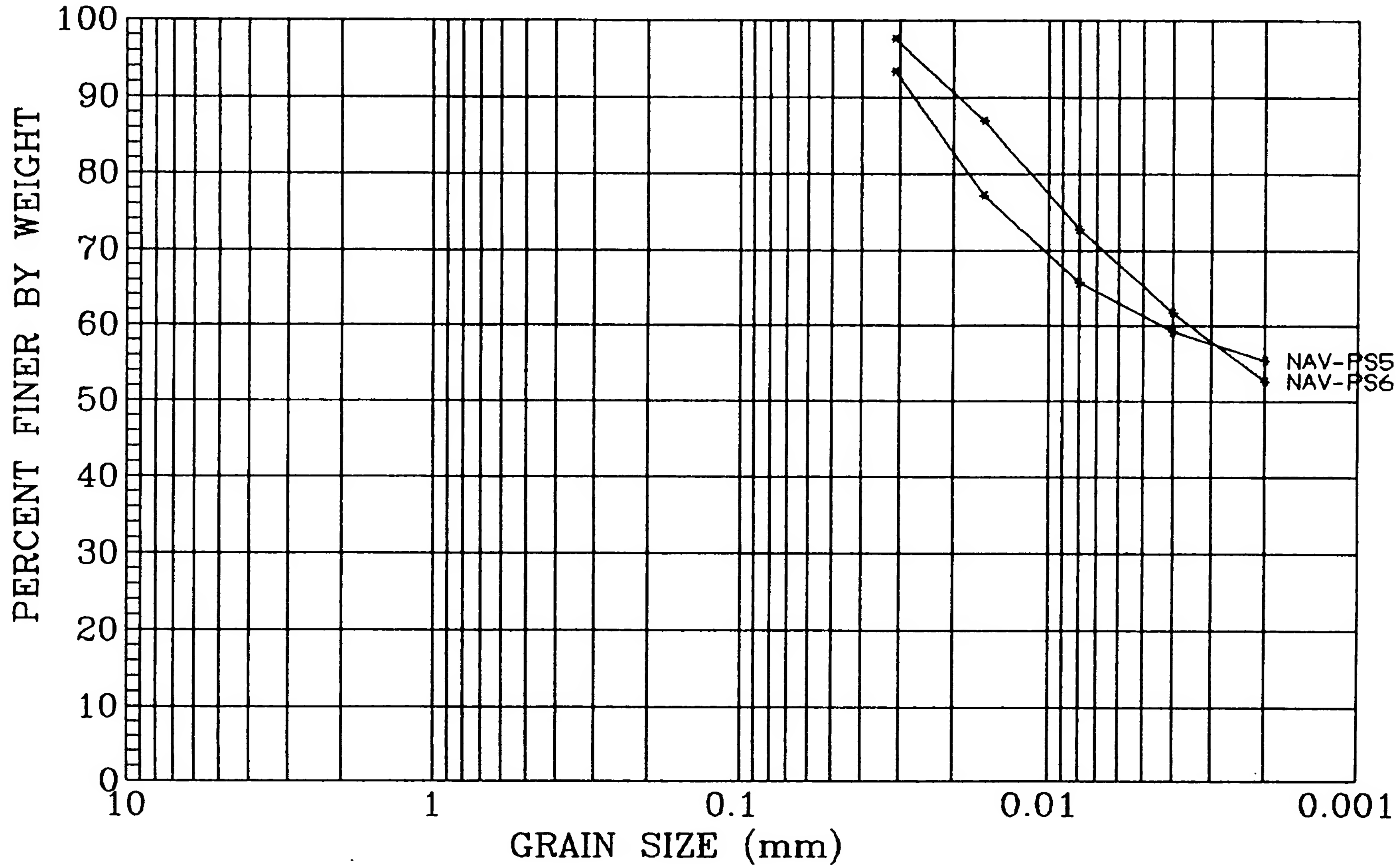
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 05/18.20/91
TIME: PS3(1119–1128)PS4(1630)
SITE: Clarks ferry
STATION:2A 12"



LAB. NO. 422
LAB. NO. 423

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

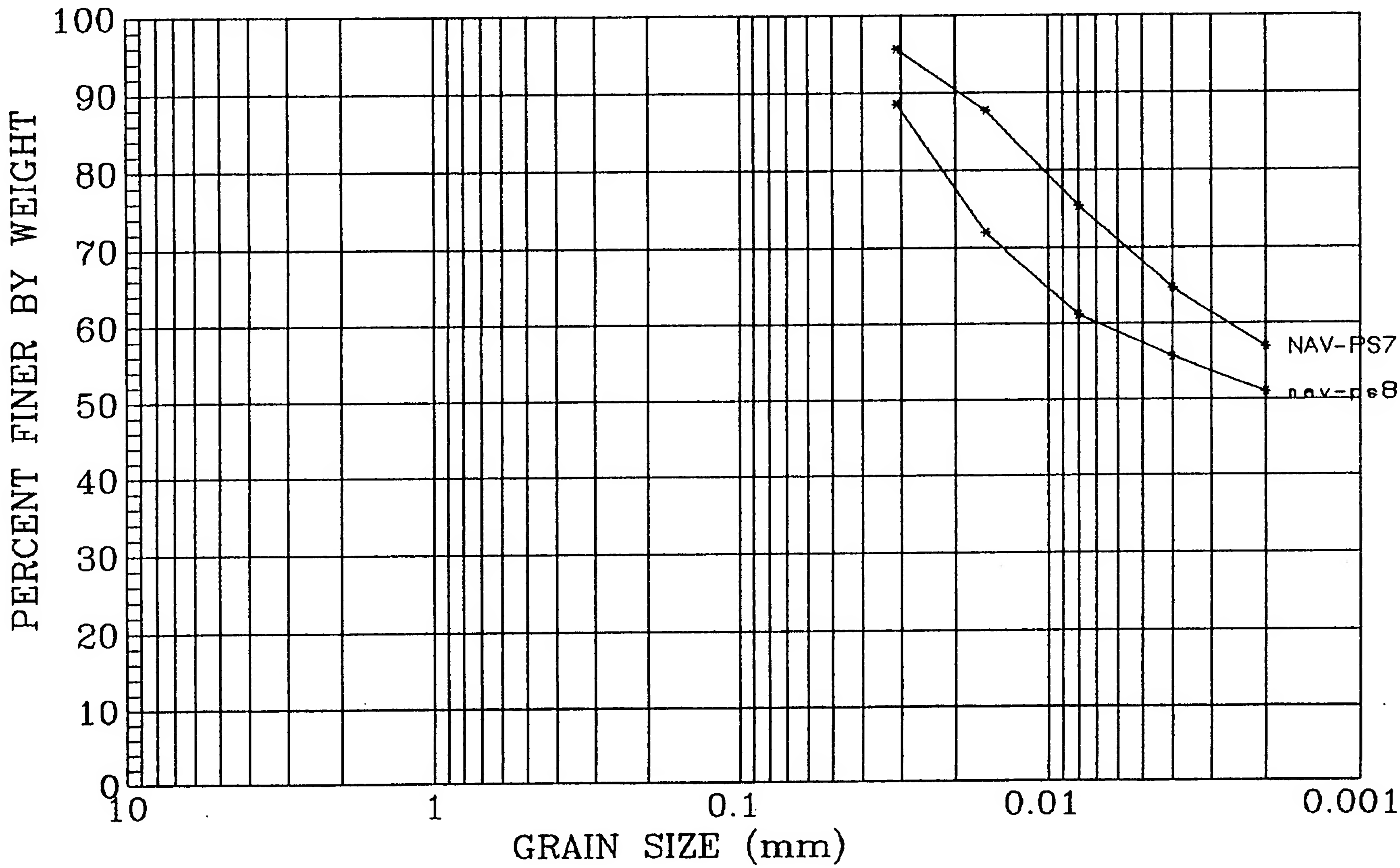
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 05/21/91
TIME: PS5(1010-1020)PS6(1119-1128)
SITE: Clarks ferry
STATION:PS5(2A 12")PS6(2B 20")



LAB. NO. 424

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

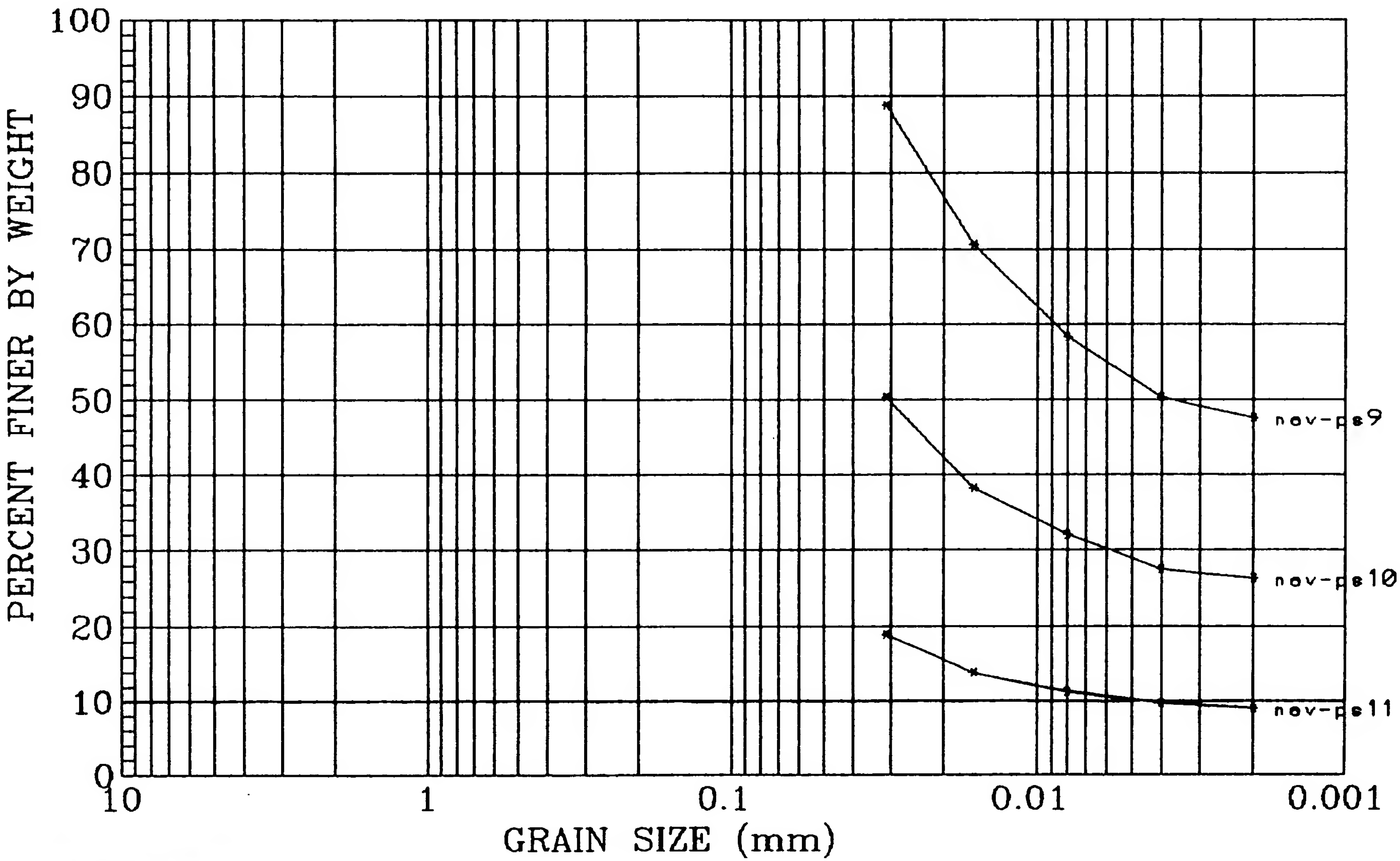
PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE:05/20/91
TIME: ps7(1119–1128)ps8(1630)
SITE: Clarks Ferry
STATION:PS7(2C 18")PS8(3A 12")



LAB. NO. 426
LAB. NO. 427
LAB. NO. 428

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

PROJECT: navigation impact
ANALYSIS DATE: 10/94
COLLECTED DATE: 05/21/91
TIME:ps9(1010–1021)ps10(1701–1714)
TIME:PS11(1701–1714)station5 66"
STATION:PS9 3A 12"PS10 5? 12"



**List of Suspended Sediment Particles Analyzed,
Kampsville, Trip 1**

Date	*Time*	*Intake station*	*Dry weight, g*	*Lab No.*
10/12/90	10:45 - 10:53	a1	1.1636	429
	10:40 - 10:53	a2	0.6856	432
	10:45 - 10:54	b1	1.2947	435
	10:45 - 10:53	b2	1.2115	438
	10:45 - 10:54	c1	1.1397	440
	10:45 - 10:54	c3	1.1964	443
10/13/90	13:12 - 13:17	a1	1.1918	430
	13:12 - 13:19	a2	1.3155	433
	13:12 - 13:18	b1	1.6101	436
	13:12 - 13:18	b2	1.4479	439
	13:12 - 13:18	c1	1.8757	441
	13:12 - 13:18	c3	1.6491	444

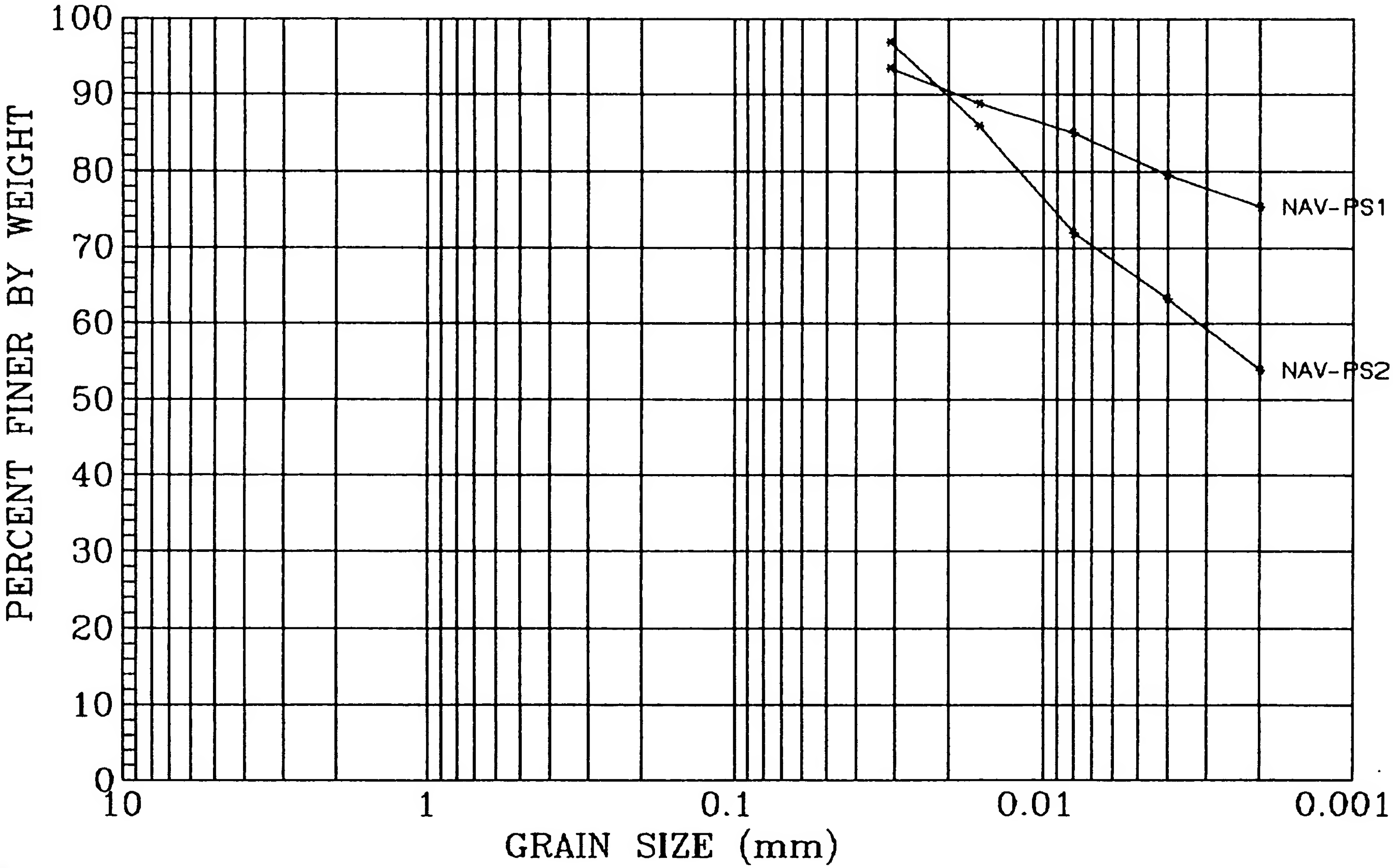
(During Barge-Tow Passage)

Date	*Time*	*Barge*	*Intake station*	*Dry weight, g*	*Lab No.*
10/15/90	09:48 - 09:54	A. Randall	a1	1.8782	431
	09:48 - 09:54	A. Randall	a2	1.8800	434
	09:48 - 09:54	A. Randall	b1	1.9839	437
	09:48 - 09:54	A. Randall	c1	2.0329	442
	09:48 - 09:54	A. Randall	c3	1.8598	445

LAB. NO. 429
LAB. NO. 430

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

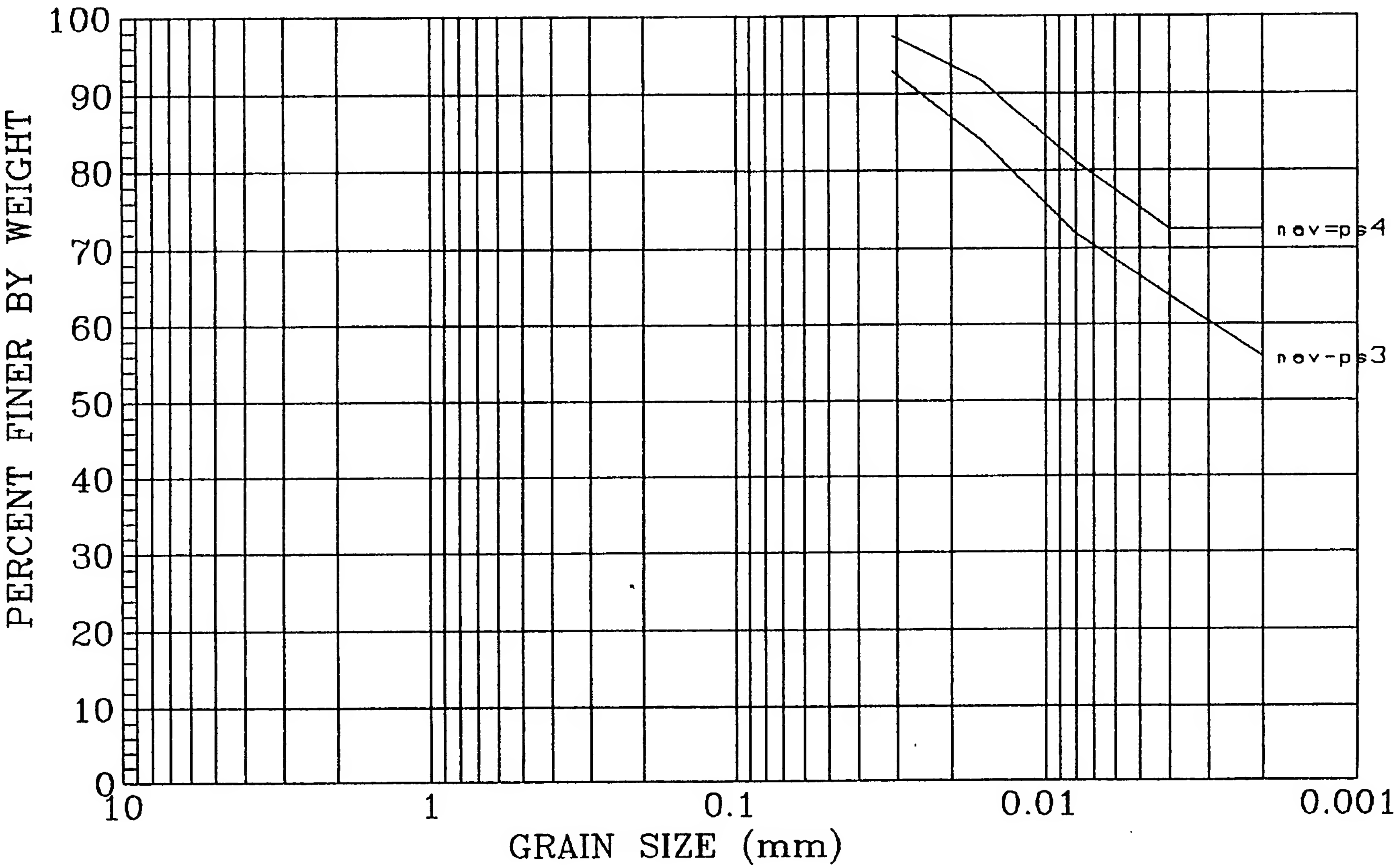
PROJECT: navigation impact
ANALYSIS DATE: 12/94
COLLECTED DATE: 10/12/90
TIME:PS1(1045–1053)PS2(1312–1317)
SITE: Kampsvill
STATION:PS1(1A 6"Background)
ps2(1A Background)



LAB. NO. 431
LAB. NO. 432

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

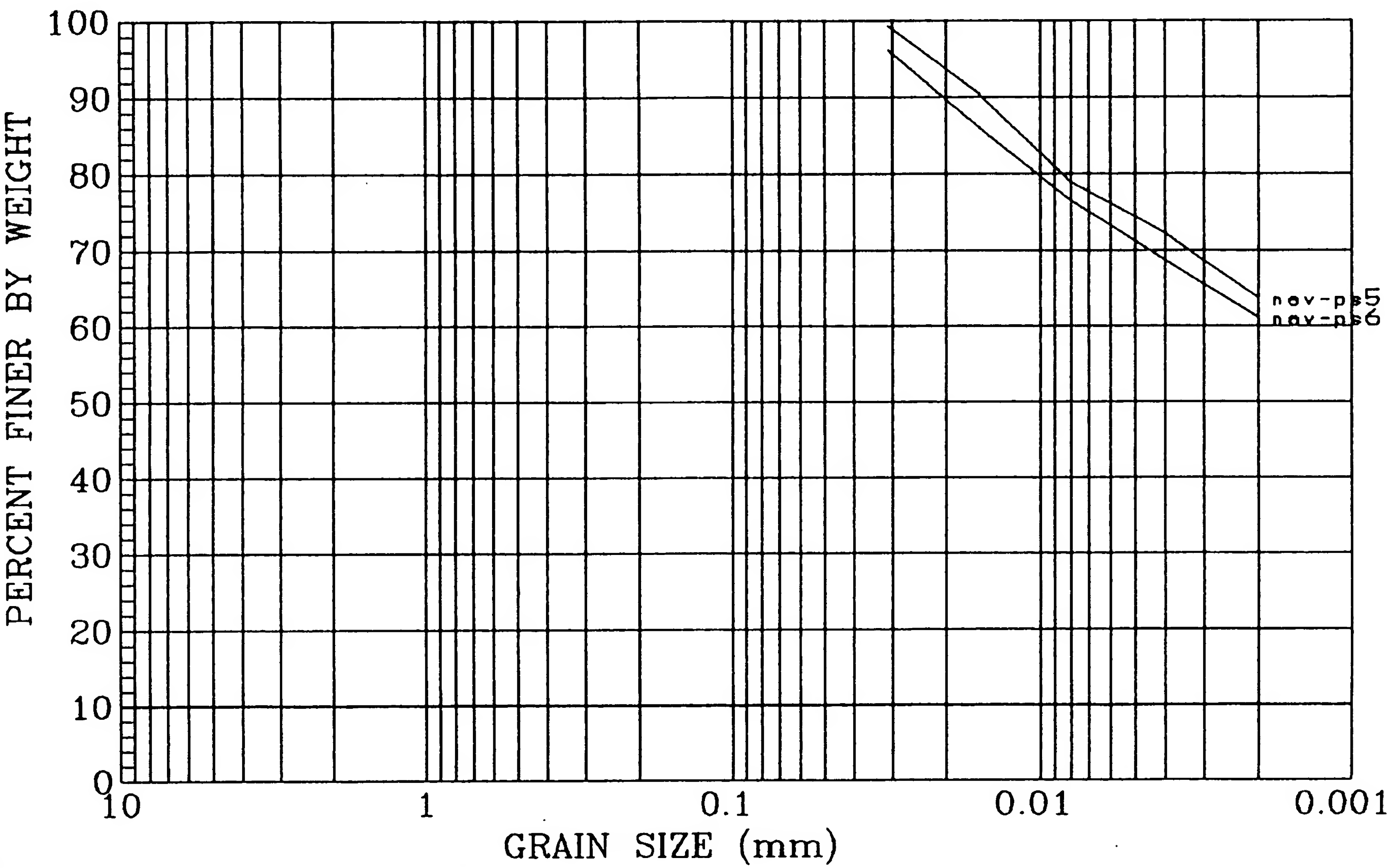
PROJECT: navigation impact
ANALYSIS DATE: 01/06/95
COLLECTED DATE: 10/90
TIME: ps3(948-954)ps4(1040-1053)
SITE: kampsvill
STATION:PS3(1A event)ps4(1B Background)



LAB. NO. 433
LAB. NO. 434

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

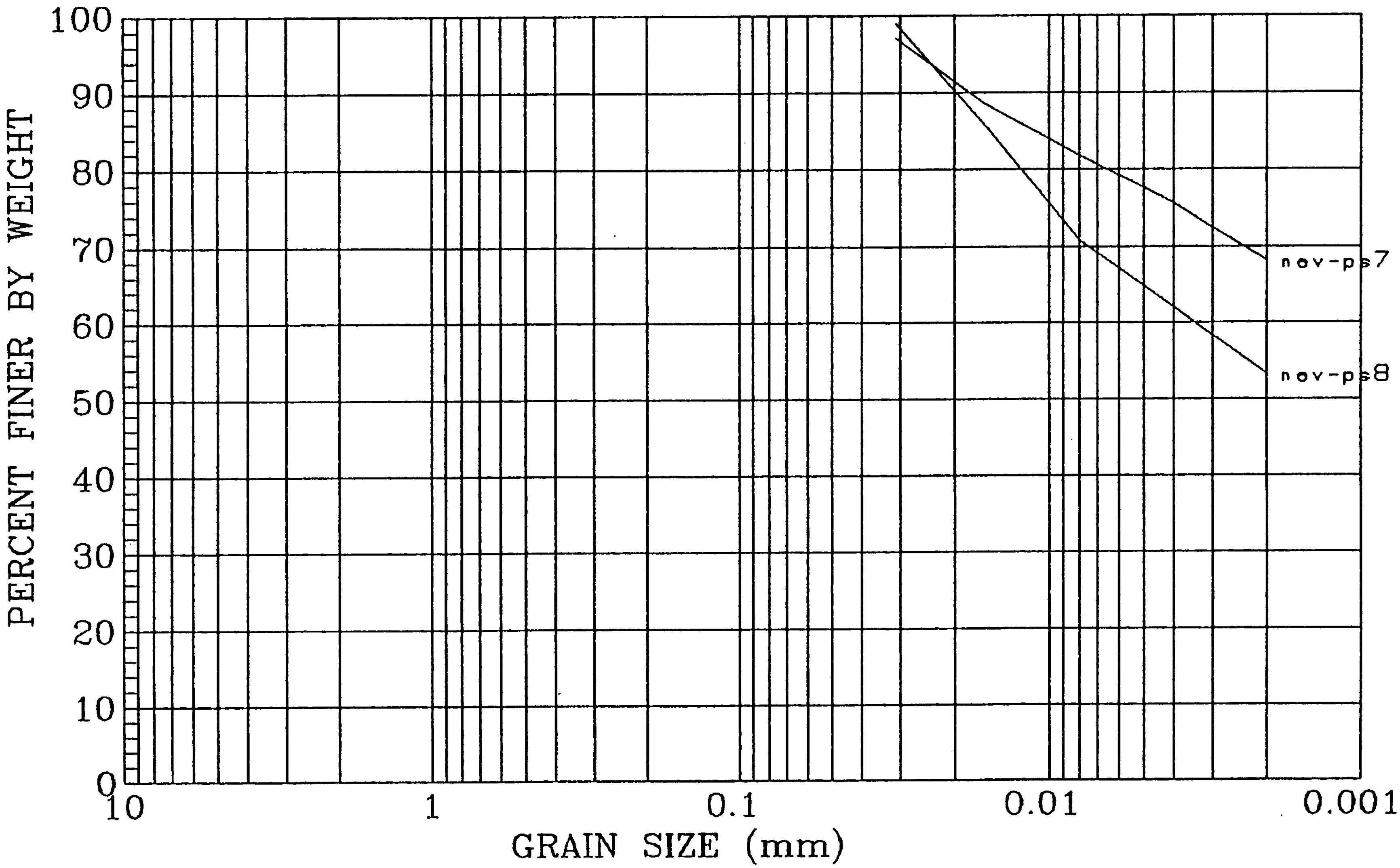
PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE: 10/90
TIME:ps5(1312-1319)ps6(948-954)
SITE: Kampsvill
STATION:PS5(1B Background)ps6(1B Event)



LAB. NO. 435
LAB. NO. 436

PROJECT: navigation impact
ANALYSIS DATE:01/95
COLLECTED DATE:10/90
TIME:ps7(1045-1054)ps8(1312-1318)
SITE:Kampsvill
STATION:PS7(2A Background)

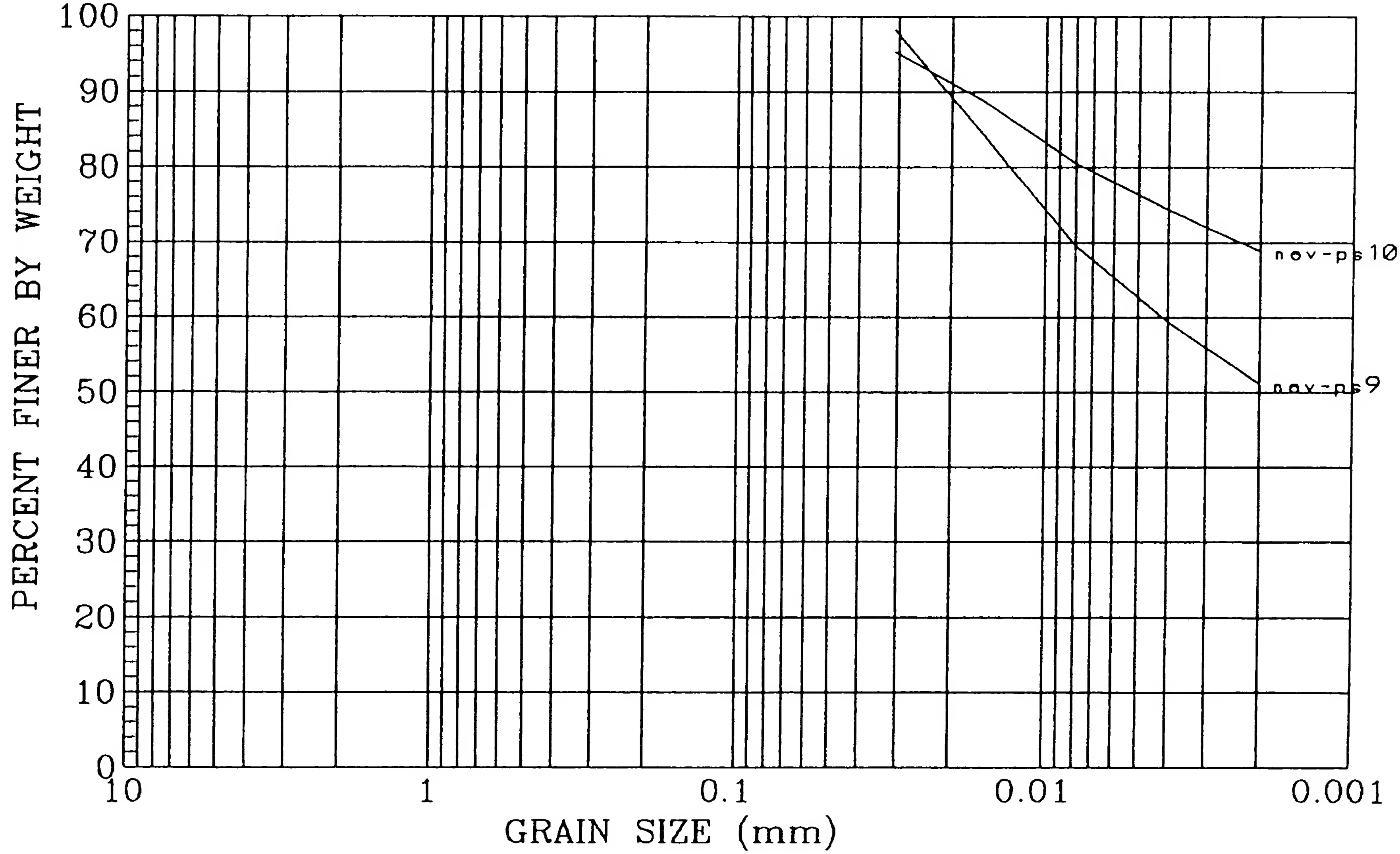
ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY



LAB. NO. 437
LAB. NO. 438

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

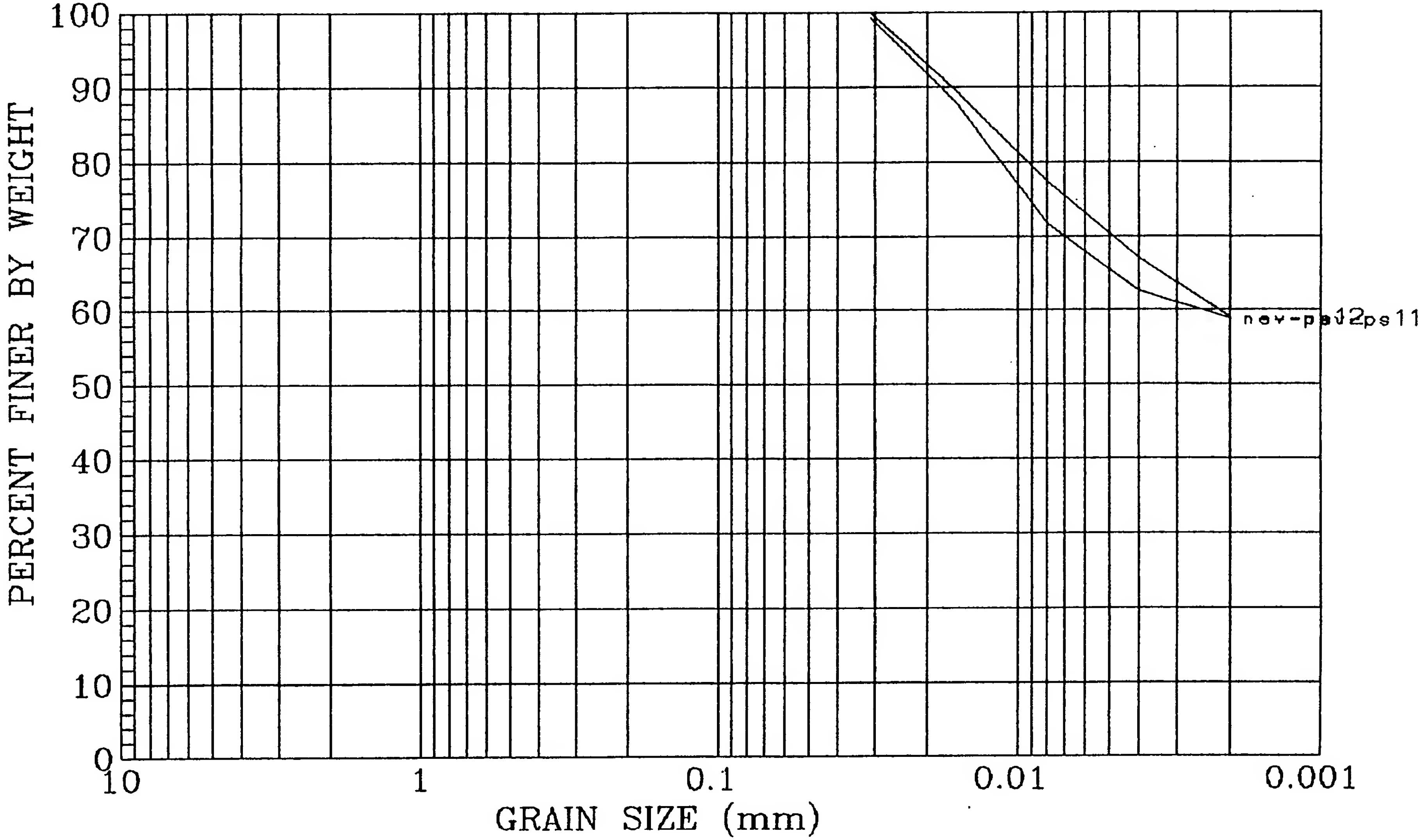
PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE:10/90
TIME:ps9(948-954)ps10(1045-1053)
SITE:Kampsvill
STATION:ps9(2A Event)ps10(2B Background)



LAB. NO. 439
LAB. NO. 440

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

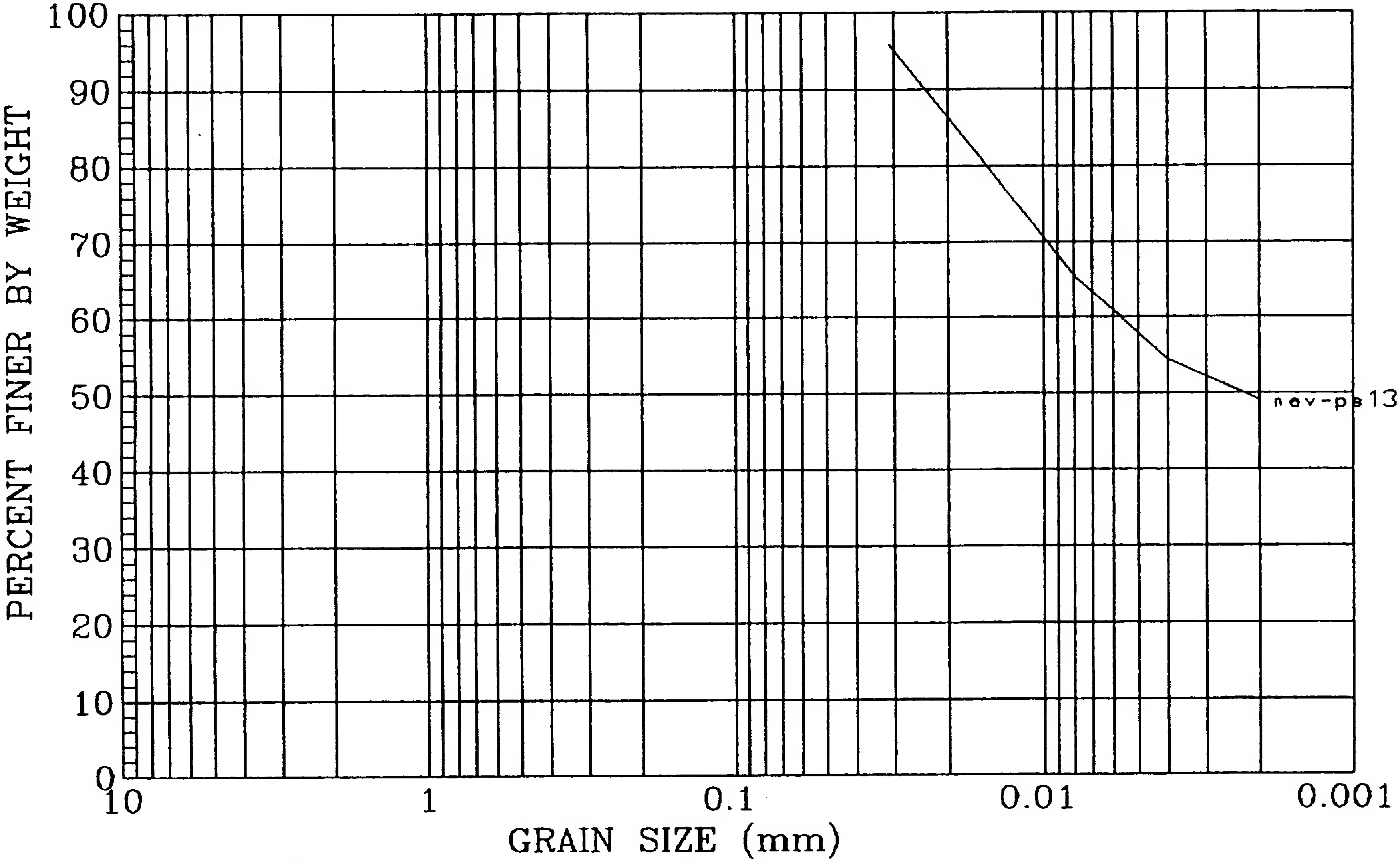
PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE:10/90
TIME:ps11(1312–1318)ps12(1045–1054)
SITE: Kampsvill
STATION:PS11(2B Background)
ps12(3A Background)



LAB. NO. 441

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

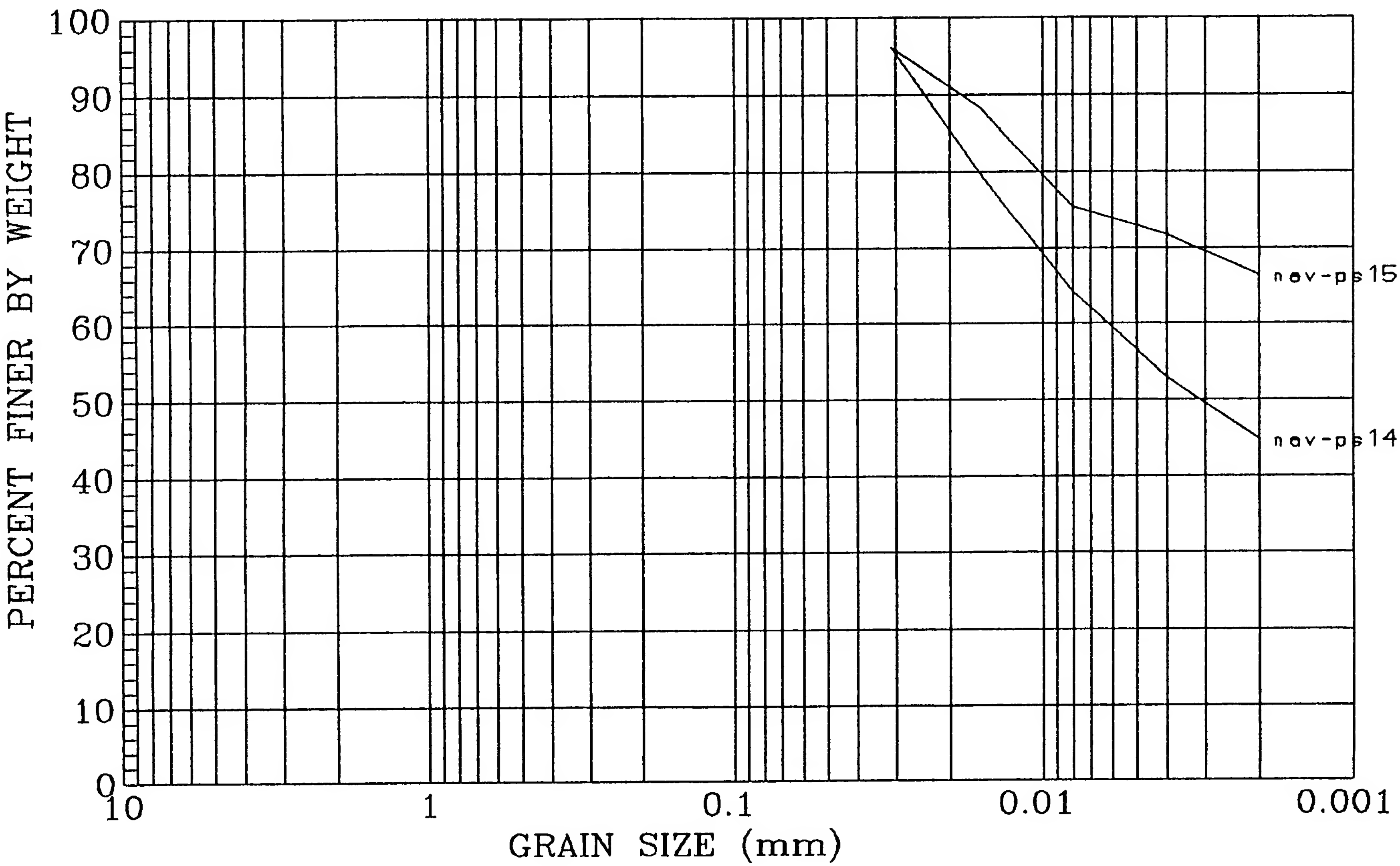
PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE:10/90
TIME: 1312–1318
SITE: Kampsvill
STATION:3A Background



LAB. NO. 442
LAB. NO. 443

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

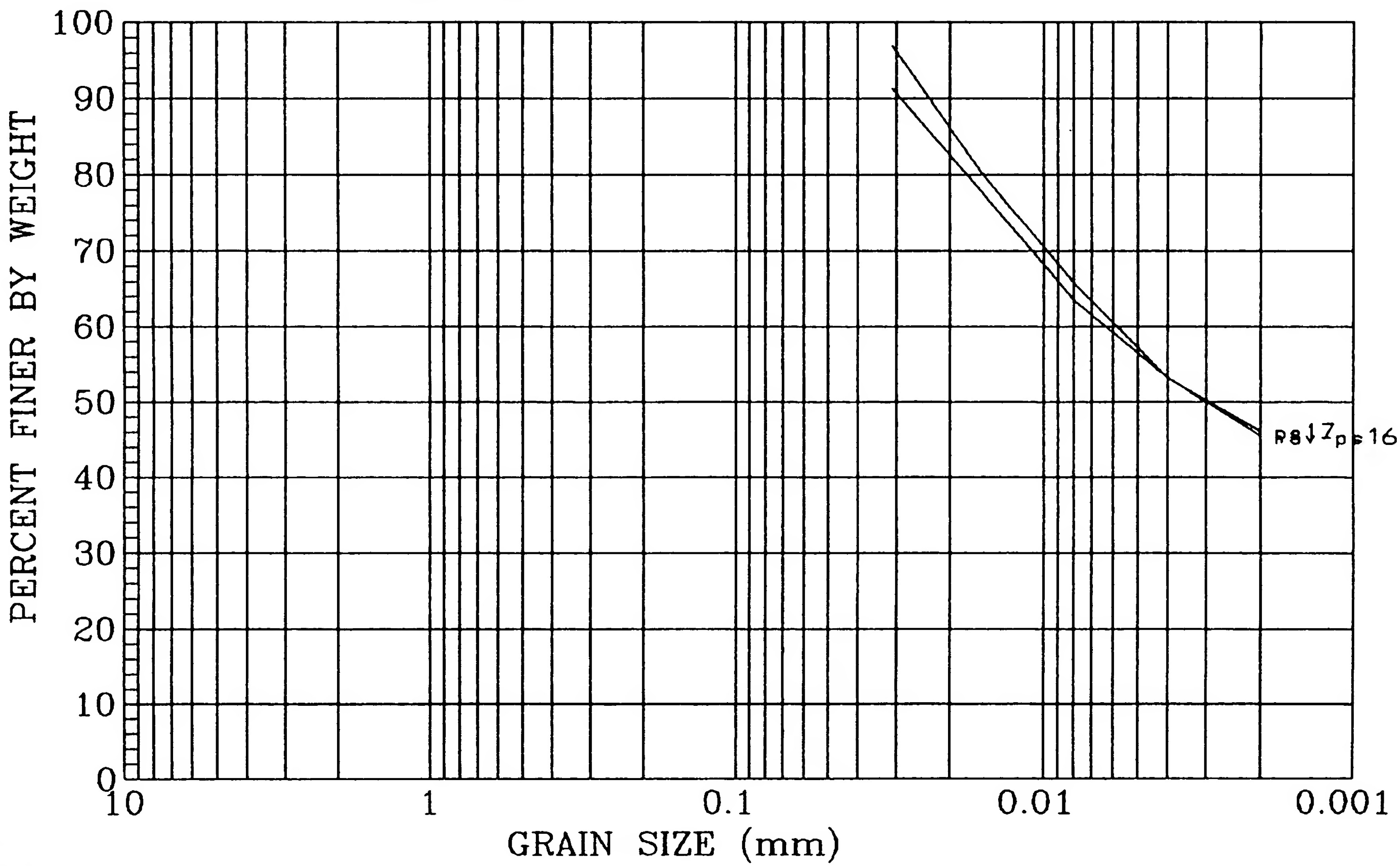
PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE:10/90
TIME:ps14(948–954)ps15(1045–1054)
SITE: Kampsvill
STATION:PS14(3A Event)ps15(3c Background)



LAB. NO. 444
LAB. NO. 445

ILLINOIS STATE WATER SURVEY
SEDIMENT LABORATORY

PROJECT: navigation impact
ANALYSIS DATE: 01/95
COLLECTED DATE:10/90
TIME:ps16(1312-1318)ps17(948-954)
SITE: Kampsvill
STATION:PS16(3C Background)ps17(3c Event)



APPENDIX XXX.

A PREDICTIVE METHOD FOR MAXIMUM RETURN VELOCITY

CROSS-SECTIONAL DISTRIBUTION OF RETURN FLOW

The variation of flow velocity from barge to bank is important for any study on the physical changes caused by navigation traffic. There are few available methods to compute the shape of the lateral velocity distribution. In all the methods, the predicted return velocity distributions decrease exponentially with distance from the barge to the shoreline.

However, using velocity data collected from a natural river such as the Illinois River, a distinct lateral distribution of the return flow can be observed. It is seen that barge movements either upstream or downstream generate a pronounced return current that has a much broader width from the shoreline and moves in the direction opposite the motion of the barge. On the other hand, the velocity at the wall of the barge should be equal to the barge speed, because of the no-slip condition. Thus, based on the continuity relationship, there should exist a location, probably near the barge, where the return velocity is zero. For the purpose of determining the lateral velocity distribution and the development of an equation, the channel is conceptually subdivided into four lateral subchannels, each extending from the water surface to the river bed (figure XXX-1). In this figure, it is assumed that the channel geometry is symmetrical. Most of the velocity data were collected from subchannel 4 at four lateral locations at the Kampsville site.

Figure XXX-1 indicates that subchannels 2 and 3 located on either side of the barge are narrow. Thus water probably moves along with the barge. A quantification of the velocity distribution within these two subchannels must be done within a laboratory setup since it is almost impossible to collect field data in a natural river within such close proximity to the barge. The flow within subchannels 2 and 3 may be called shear flow. At the wall of the barge, current velocity should be equal to the barge speed. Away from the barge boundary, it is assumed that the flow velocity decreases almost linearly and becomes zero at a certain lateral location. This location can

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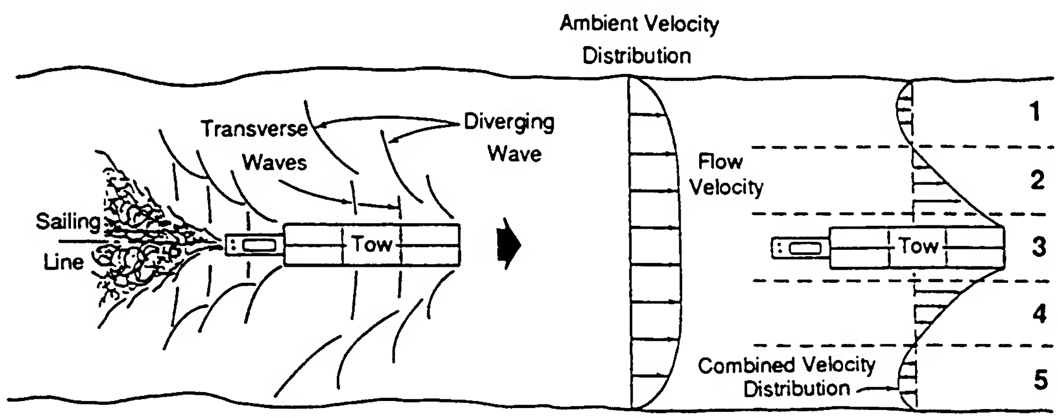


XXX-1. Conceptual distribution of return velocity across the width of a channel due to barge-tow movement

be approximated by using the conservation of water volume. The volume of water moving at any instant in subchannel 4 or 1 should be equal to the volume of water in subchannel 3 or 2. Using this concept, it is possible to predict the location along the width of the river away from the barge where the flow velocity is equal to zero. In other words, the width of subchannel 3 or 2 can be determined. Introducing $\eta = y/W_s$ as the nondimensional width of the channel and t_s as the width of subchannel 3 or 2, where y is the distance from the barge and W_s is the distance of the barge from the shoreline, the region of these two subchannels extends from $\eta = 0$ to $\eta = \eta_0 = t_s/W_s$. The values of η_0 should be dependent on the barge-tow configuration, barge speed, and barge draft. Thus, η_0 can be related with the barge length Froude number $u_s/(gL)^{0.5}$ and draft Froude number $u_s/(gd)^{0.5}$, where L is the barge length.

Figure XXX-2 shows the relationship between η_0 and the product of the above two Froude numbers for either upstream or downstream-bound barges. Based on data from the 11 events, Eqs. (1) and (2) for determining η_0 have been developed as:

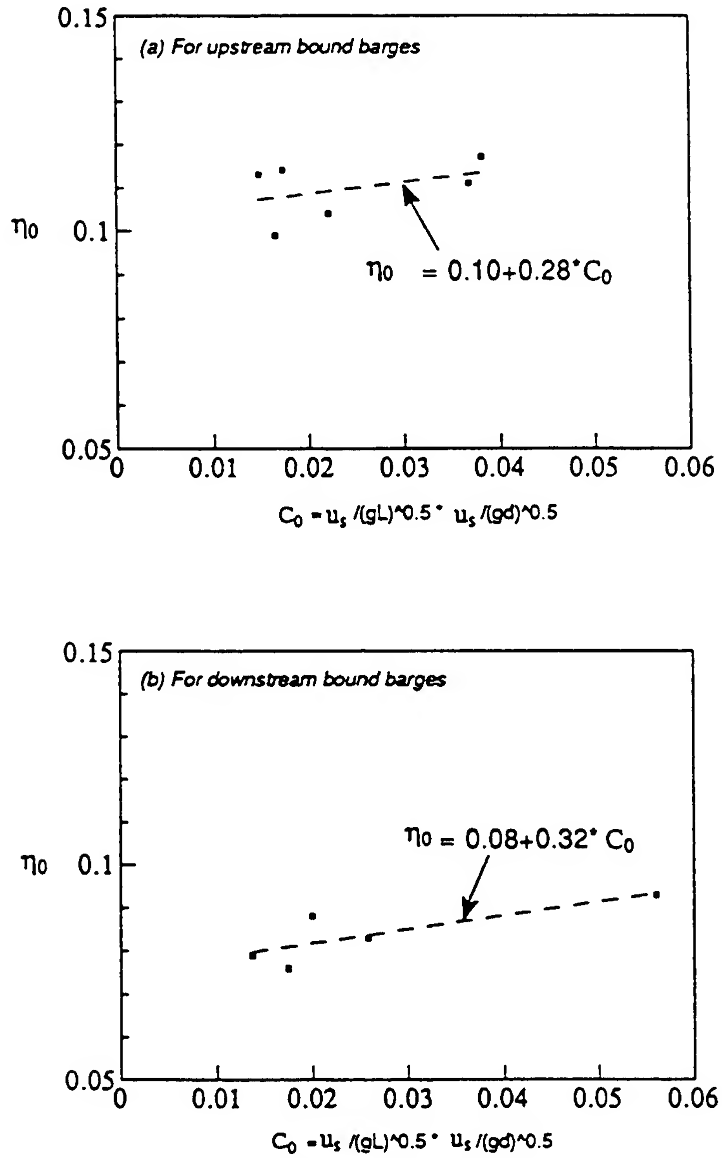
$$\eta_0 = 0.10 + 0.28\ C_0 \quad \text{(upstream-bound barges)} \tag{1}$$

and

$$\eta_0 = 0.08 + 0.32\ C_0 \quad \text{(downstream-bound barges)} \tag{2}$$

where $C_0 = \{u_s/(gL)^{0.5}\}\{u_s/(gd)^{0.5}\}$.

Subchannels 1 and 4 located near the shore are fairly wide. In these two subchannels, all the fluid particles are assumed to move in one direction, which is opposite that of the barge motion from the zone of higher pressure to lower pressure. This flow within subchannels 1 and 4 is return flow, or parallel flow, and its distribution follows a parabola-like shape. The region of subchannels 4 and 1 extends from $\eta_0 = t_s/W_s$ to $\eta = 1$. Thus, it appears that two different types of velocity distribution do exist within two different subchannels when a barge moves within a natural channel.



XXX-2. Variations of η_0 for upstream and downstream bound barges

With this concept in mind, it is postulated that in subchannel 3 or 2, the flow velocity decreases almost linearly from the barge speed u_s at $\eta = 0$ to zero at $\eta = \eta_0$. The lateral distribution of flow velocity can be thought of as a quasilinear profile within these two zones and expressed as:

$$u_1(\eta) = u_s(1 - \eta/\eta_0)(1 - \eta) \qquad (0 \leq \eta \leq \eta_0) \tag{3}$$

In subchannel 4 or 1, the flow velocity is zero at the bank boundary ($\eta = 1$) to satisfy the no-slip condition, then gradually increases with the distance from the shoreline, and finally decreases to zero at $\eta = \eta_0$. The lateral velocity distribution of this return flow in these two subchannels is parabola-like and can be expressed as:

$$u_2(\eta) = a_1(1 - \eta)(\eta_0 - \eta)\exp(a_2\eta)/(a_2\eta)^m \qquad (\eta_0 \leq \eta \leq 1) \tag{4}$$

where a_1 and a_2 are coefficients to be determined based on field data. The coefficient a_1 physically represents the pressure gradient. Thus, a_1 is related to the blocking factor, A_m/A_c, and the barge draft Froude number, $u_s/(gd)^{0.5}$. Figure XXX-3 shows the relationship between a_1 and the product of the blocking factor and draft Froude number, C_1, for upstream- and downstream-bound barges. Based on data from the 11 events, Eqs. (5) and (6) for determining a_1 have been developed as:

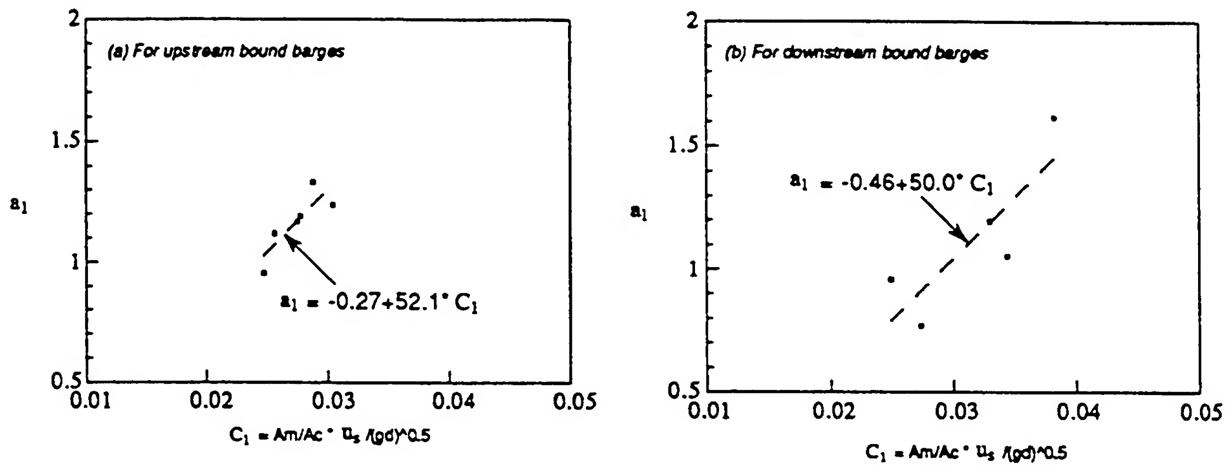
$$a_1 = -0.27 + 52.1\, C_1 \quad \text{(upstream-bound barges)} \tag{5}$$

and

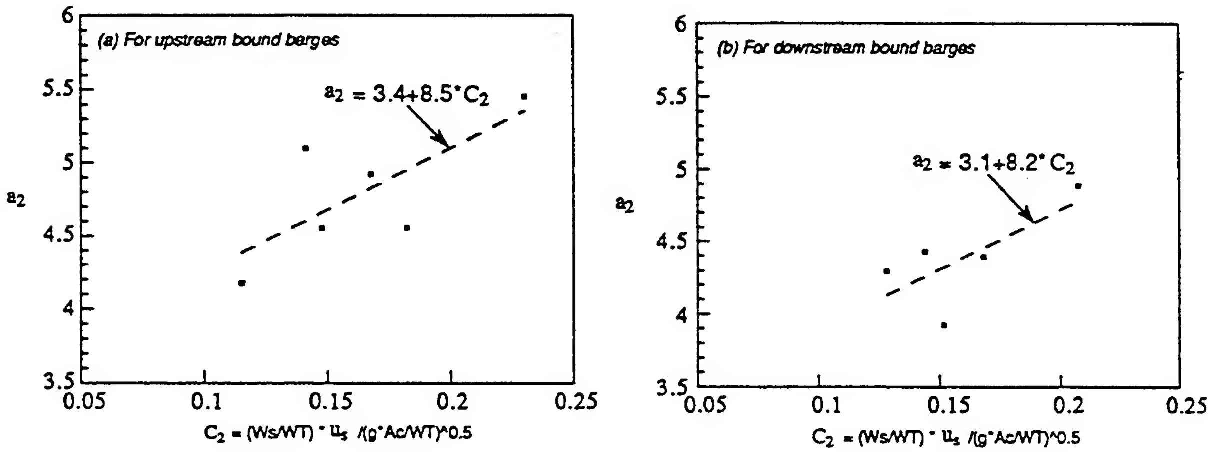
$$a_1 = -0.46 + 50.0\, C_1 \quad \text{(downstream-bound barges)} \tag{6}$$

where $C_1 = (A_m/A_c)\{u_s/(gd)^{0.5}\}$.

The coefficient a_2 physically represents the effects of the nonuniformity of the lateral velocity distribution. Thus a_2 is dependent on the relative distance W_s/W_T and the channel Froude number $u_s/(gA_c/W_T)^{0.5}$. The relationship between a_2 and the product of the relative distance and channel Froude number, C_2, is shown in figure XXX-4 for upstream- and downstream-bound barges. Thus, based on data from the 11 events, Eqs. (7) and (8) for determining a_2 are as follows:



XXX-3. Variations of a_1 for upstream and downstream bound barges



XXX-4. Variations of a_2 for upstream and downstream bound barges

$$a_2 = 3.4 + 8.5\ C_2 \qquad \text{(upstream-bound barges)} \qquad (7)$$

and

$$a_2 = 3.1 + 8.2\ C_2 \qquad \text{(downstream-bound barges)} \qquad (8)$$

where $C_2 = (W_s/W_T)\{u_s/(gA_c/W_T)^{0.5}\}$.

Exponent m in Eq. (4) relates to the existence of the nonuniformity of the velocity distribution across the width of the channel. Thus it is reasonable to expect it to be related with the relative distance and channel Froude number. Such relationships between m and the product of the relative distance and channel Froude number, C_m, are shown in figure XXX-5 for upstream- and downstream-bound barges. Eqs. (9) and (10) describe these relationships as:

$$m = 2.1 + 3.5\ C_m \qquad \text{(upstream-bound barges)} \qquad (9)$$

and

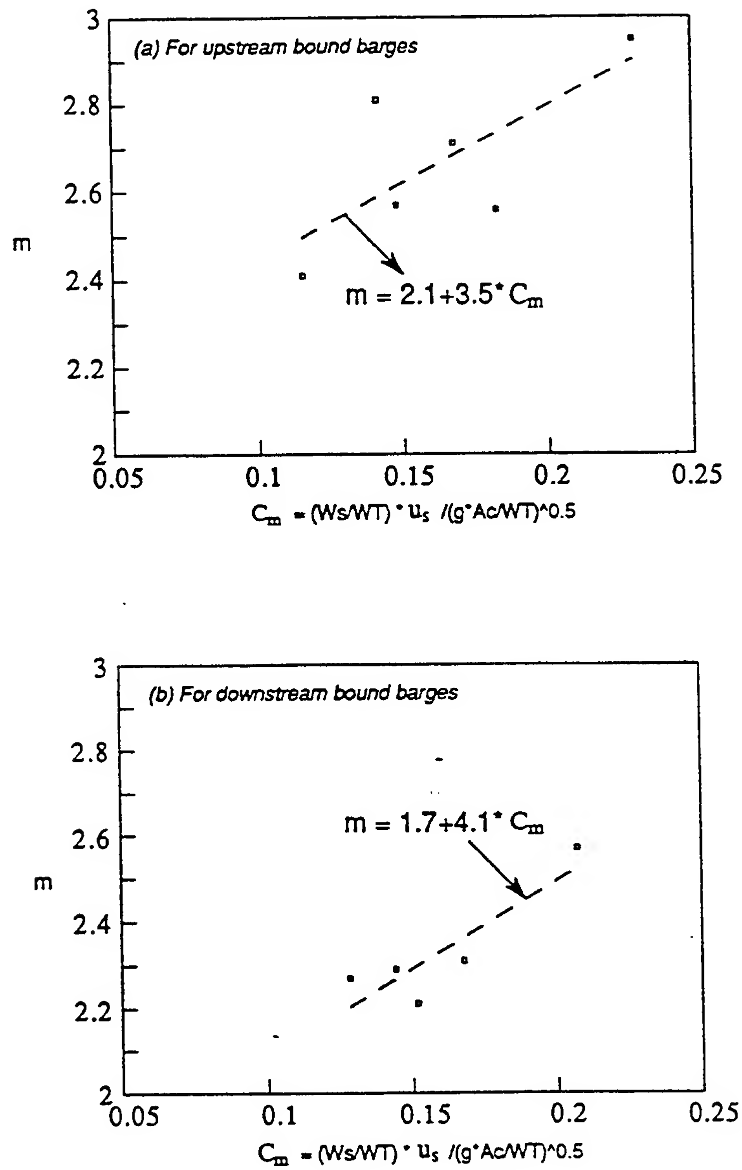
$$m = 1.7 + 4.1\ C_m \qquad \text{(downstream-bound barges)} \qquad (10)$$

where $C_m = (W_s/W_T)\ \{u_s/(gA_c/W_T)^{0.5}\}$.

The final boundary conditions for the determination of the velocity distribution profile between the barge and the shoreline are: (a) $u = u_s$ at the barge boundary; (b) $u \approx 0$ at η_0; and (c) $u = 0$ at the shoreline. The flow velocity distribution across the width of the channel between the barge and the shoreline can thus be written as:

$$\begin{aligned} u_{us}(\eta) &= u_1 + u_2 \\ &= u_s(1 - \eta/\eta_0)(1 - \eta) + a_1(1 - \eta)(\eta_0 - \eta)\exp(a_2\eta)/(a_2\eta)^m \qquad (11) \end{aligned}$$

where $u_{us}(\eta)$ is the flow velocity generated by a barge-tow moving upstream. For a downstream-bound barge, the velocity profile will be negative, i.e., $u_{ds}(\eta) = -u_{us}(\eta)$ where $u_{ds}(\eta)$ is the flow velocity generated by the downstream-moving barge-tow. Therefore, it can be stated that the lateral flow velocity distribution between the barge and the shoreline is a combination of shear flow in subchannel 3 or 2 and parallel flow (return flow) in subchannel 4 or 1 (see figure XXX-1).



XXX-5. Variations of m for upstream and downstream bound barges

APPENDIX XXXI.

TECHNICAL PAPERS PUBLISHED BY WATER SURVEY RESEARCHERS IN REFEREED JOURNALS

Turbulence in Rivers due to Navigation Traffic[a]

By Bijoy S. Mazumder,[1] Nani G. Bhowmik,[2] Fellow, ASCE, and Ta W. Soong,[3] Member, ASCE

Abstract: This paper presents the research results of statistical parameters associated with turbulence in a natural river caused by the movement of navigation traffic. Movement of navigation traffic within restricted inland waterways, such as the Illinois, Mississippi, or Ohio Rivers, changes their flow characteristics temporarily in space and time. These spatial and temporal changes must be quantified in order to assess their effects on biologically sensitive areas, and they have seldom been evaluated for natural waterways. Data are collected from the Illinois River to evaluate these changes. The longitudinal and lateral components of fluctuating velocity (u', v'), Reynolds stress ($-\rho u'v'$), turbulent intensities (σ_x, σ_y), turbulent kinetic energy (TKE), and maximum return velocity generated by navigation traffic are analyzed here. Results have shown that significant changes occur in all of these parameters. The largest changes take place in a zone within 10% of the channel width from the shore.

Introduction

Movement of barge traffic in a restricted waterway is associated with physical changes in flow parameters limited in space and time. A thorough understanding of navigation impacts on riverine habitats requires a thorough understanding of these physical processes. Field data have been collected and analyzed to determine changes in velocity structures in the channel border areas due to commercial navigation on the Upper Mississippi River System (UMRS).

Physical changes associated with barge-tow movement can be explained schematically, as shown in Fig. 1 [after Blaauw et al. (1984); Bhowmik and Mazumder (1990)]. These physical changes include return flow, waves, drawdown, and screw wash. If the barge tow moves in stagnant surroundings, the wave pattern will move with the barge, as shown in Fig. 1 by the front wave at (A). Due to the movement of the barge, flow velocity beside the barge will accelerate in the opposite direction (return current), and the water level will drop within the channel to maintain the continuity of flow, as shown by drawdown (h) or water-level depression. The resulting velocity structure is composed of two parts: barge-induced displacement velocities and tow-induced propeller jet velocities. The turbulent jet flow behind the vessel is generated through the direct action of the propellers, its velocity distribution is normally assumed to be symmetrical around the axis of the

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[a]Part of this paper was presented at the 1991 ASCE National Conference on Hydraulic Engineering in Nashville, TN.

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Note. Discussion open until October 1, 1993. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on October 8, 1991. This paper is part of the ***Journal of Hydraulic Engineering***, Vol. 119, No. 5, May, 1993. ©ASCE, ISSN 0733-9429/93/0005-0581/$1.00 + $.15 per page. Paper No. 2787.

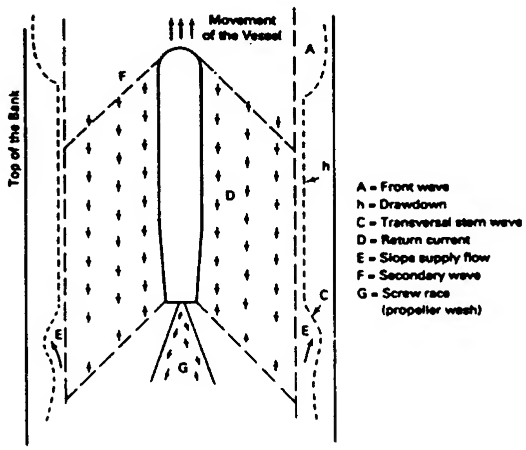

FIG. 1. Schematic Design Showing Water Motion Generated by Moving Ship in Stagnant Water (after Blaauw et al. 1984)

propeller, similar to a three-dimensional jet flow. The schematic diagram in Fig. 1 represents ideal conditions only. In a real waterway, the return flow patterns are not parallel to the vessel or the shoreline, and a complex flow pattern is generated. The present research addresses some of these phenomena.

Previous investigations on traffic effects in restricted waterways were mostly concentrated on return flows, drawdown, waves, and propeller jet velocities. Several methods have been developed by researchers such as Schijf and Jansen (1953), Tothill (1966), Sharp and Fenton (1968), and Bouwmeester (1977) to compute drawdown and return flows beside the barge on the basis of conservation of mass, momentum, and/or energy. Empirical formulas to compute return flows beside the barge have been developed by Fuehrer and Romisch (1977), Simons et al. (1981), Berger et al. (1981), and Hochstein and Adams (1989). Blaauw and van der Knaap (1983) reviewed methods for computing the drawdown and average return flow. Tow-induced propeller jet velocities were computed through an analogy with a turbulent jet with a symmetrical Gaussian distribution from the axis of the propeller (Blaauw and van de Kaa 1978; Verhey 1983).

However, other parameters, such as turbulent characteristics due to barge traffic, have been elusive because of lack of data. And previous studies emphasized canal systems, so the basic assumptions must be re-examined to apply to a large natural river. The main objective of this paper is to analyze the turbulent characteristics of flows induced by barge traffic in a natural river. Turbulent characteristics in large rivers due to the movement of the barge traffic are fundamental to the study of sediment resuspension and the effects, if any, of these changed physical processes on aquatic habitats. Parameters analyzed included the cross-sectional and vertical distribution of return velocity, turbulent Reynolds stress, $(-\rho\overline{u'v'})$; turbulence intensities (σ_x, σ_y); and turbulent kinetic energy (TKE). These parameters are compared for both background conditions and barge passage conditions.

A basic explanation of physical changes due to navigation was presented as a technical paper at the *1990 National Conference on Hydraulic Engineering* (Bhowmik and Mazumder 1990). Some results on turbulence and Reynolds stress associated with navigation traffic were presented at the *1991 National Conference on Hydraulic Engineering* (Mazumder et al. 1991).

Many researchers, such as Raichlen (1967), McQuivey and Richardson (1969), Nakagawa and Nezu (1981), and Nezu and Rodi (1986), have conducted experiments to determine mean flow and turbulent characteristics in open-channel flow. Recently, the laser doppler anemometer has been used for advanced investigations of turbulent structures in compound channels (Knight and Shiono 1990) and in submerged hydraulic jumps (Long et al. 1990) in laboratory settings. However, no detailed investigation has been performed with an array of 2-D current meters in a riverine environment other than the present research conducted by the Illinois State Water Survey (ISWS).

Instrumentation and Field Data Collection

Data were collected from two sites on the Illinois River. The first site is near McEver's Island at river mile (RM) 50.1 (80.2 km). The second site is near Kampsville at RM 35.4 (56.6 km) River miles on the Illinois River start from the confluence of the Illinois and Mississippi Rivers. Cross-section profiles for these two sites with the instrument configuration are shown in Fig. 2. Both cross sections are trapezoidal, but the McEver's Island site was approximately 100 m narrower than the Kampsville site.

Fig. 2 also shows the coordinate system used for this research. It should be noted that the data from McEver's Island were collected on the left-descending bank (LDB) of the river while data from the Kampsville site

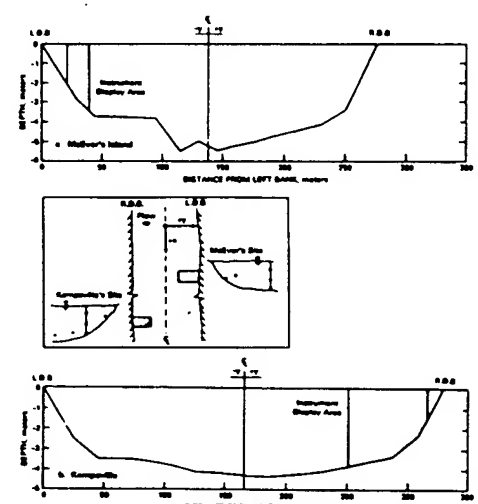

FIG. 2. Definition Scratch of Coordinate System and Cross-Sectional Profiles of Two Sites

were collected on the right-descending bank (RDB). The x-axis is along the main stem of the river, positive in the downstream direction. The y-axis is perpendicular to the x-axis and positive toward the LDB of the river. The z-axis is normal and upward from the xy plane. Thus, two sets of data were collected from two separate sides of the river at two different cross sections. Because of these differences, notations on various figures along the y-axis (to be discussed later) may show plus (McEver's Island) or minus (Kampsville), depending on the location of the survey.

Velocity data were collected using a set of two-dimensional (2-D) electromagnetic current meters installed along a cross section from the shore to the sailing line, manufactured by Marsh–McBirney, Inc. (MMB). The water-velocity sensor is based on the Faraday principle of electromagnetic induction, where a conductor, such as water moving in a magnetic field, produces a voltage that is proportional to the velocity of the water. The ISWS used two different types of meters in the field experiment, MMB 511 and MMB 527. At the McEver's Island site, four MMB 511s and one MMB 527 were used. At the Kampsville site, they used four MMB 511s and two MMB 527s. The accuracy of these meters and their basic capabilities are given in Table 1. Further information can be obtained from the user's manual (*Instruction Manual* 1991).

The data collection scheme focused on information closer to the channel bed as well as on lateral variations. Therefore, the current meters were installed about 1 m above the bottom and aligned in a transect. However, the vertical distributions of the **u** and **v** components were also measured at one station at each site (Fig. 2). The lateral distances from the LDB for the McEver's Island site were 10.5, 15.3, and 36.6 m. At 36.6 m from the LDB, three MMB 511's were arranged to measure the vertical distributions of horizontal velocities. The height of the probes was 0.15, 0.92, and 1.9 m above the bed. The depth of water at this vertical point was 3 m.

Data from the Kampsville site were collected at four stations near the RDB. The lateral distances from the RDB were 13.0, 33.6, 47.3, and 65.6 m. At 33.6 m from the RDB, a vertical array of three MMB 511s heights were 0.20, 1.22, and 2.44 m from the bottom. The total water depth at this vertical point was 3 m. The sampling rate at both sites was one sample per second, regardless of barge passage. This resolution has been proved sufficient for determining overall velocity changes and turbulent characteristics within a large river such as the Illinois.

It should be understood that in a laboratory setting, data on turbulent fluctuations of velocities could be collected at 0.3–0.1-s intervals. In a project on velocity fluctuations in oceanic environment, Soulsby (1980) discussed a relationship that may exist between sampling rates, size of sensors, and response time. He also suggested a relationship between these variables that may be valid for oceanic environments.

TABLE 1. Specifications of Current Meters

Instrument (1)	Parameters (2)	Range (3)	Accuracy (4)	Probe diameter (cm) (5)
MMB 527	**u**, **v**	±300 cm/s	±2% of reading	10.3
	Direction	0–360°	±10°	—
MMB 511	**u**, **v**	300 cm/s	±2% of reading	3.9

Note: **u** and **v** are velocity components in x- and y-direction, respectively.

Flow in a large river is essentially one-directional (with three-dimensional resolution) with fluctuating components in the lateral and vertical directions. At the initiation of the present project, the ISWS researchers discussed the applicability of Marsh–McBirney meters and the frequency of sampling with others working on the Mississippi and Ohio River systems: Ken Lubinski, U.S. Fish and Wildlife Service; Drew Miller, Waterways Experiment Station, who is also collecting data from the Mississippi River; and Terry Siemsen, U.S. Army Corps of Engineers, Louisville District, who is collecting data from the Ohio River. It was collectively decided that Marsh–McBirney meters were probably among the most rugged commercial meters available for river environments with continuous flows of drifting debris. Moreover, a frequency of one sample per second provides an excellent resolution of the fluctuating components of the velocities. At present, all the researchers mentioned previously are sampling at a frequency of one sample per second. Marsh–McBirney meters were also used by Demissie et al. (1986) to collect secondary circulation data from natural rivers and by hydrologists from Environmental Science and Engineering, Inc. ("Navigation Impact" 1981), to collect data on turbulent fluctuations of velocities from the Illinois River.

Analysis of Velocity Data

Changes in velocity during barge passage are the combined result of the ambient velocity, return flow, and the propulsive jets of the tow. Because of the return flow, the velocity vector changes temporarily with space and time in the zone between the barge and the shoreline. Apparently the velocity vector and the duration of return flow depend on the barge-tow characteristics. It is imperative to understand the changes in return flows with time and space from the barge to the shoreline.

Two components of velocity were measured at different locations between the shore and the barge. An example of typical resultant velocity is presented in Fig. 3, which demonstrates velocity vectors for 30-min periods at three different locations for a single barge-tow convoy with a draft of 2.74 m moving downstream at a speed of 2.3 m/s. The barge-tow convoy was 180 m from the LDB. This very interesting example is typical of what was observed at other locations.

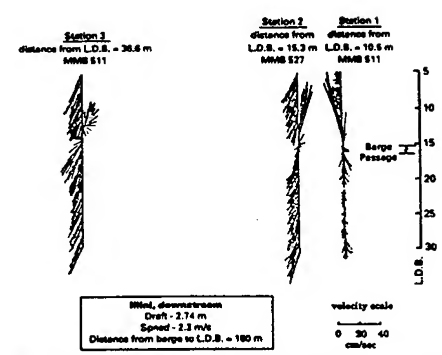

FIG. 3. Resultant Velocity Vectors during Downstream Barge Passage

Analyses such as this show the overall changes in velocity over one-half the width of the river (116 m wide at this location). Each line in Fig. 3 is a vector plot indicating the magnitude of resultant velocity averaged over 15-s intervals and its directional changes due to barge passage. This figure clearly shows that with the downstream movement of the barge, the flow moves towards the bank, and then rotates counterclockwise to an upstream direction. The rotation of flow is visible for the MMB 527 and 511 meters located 15.3 and 36.6 m, respectively, from the LDB. For the meter located 10.5 m from the LDB, even though the rotation is visible, the flow direction more or less goes back and forth in the downstream direction after the passage of the barge-tow convoy. Being close to the shoreline, this meter was obviously affected by the breaking waves in this shallow area.

For upstream barge movement, the flow initially moved toward the sailing line and then rotated counterclockwise to the downstream direction. Data collected from other events have shown similar patterns, with the magnitudes of the velocity vectors changing the speed, direction, and river flow characteristics of the test area.

Temporal Variations of Velocities and Reynolds Stress

Analyses of the temporal variations of the velocities and Reynolds stress are described briefly in this section. Velocity measured during a 10–15-min period just before the barge passage is called "background velocity," and the disturbances created due to the barge passage in the cross section are called the "event." The flow characteristics of background velocity, and their direct comparisons with net velocity changes due to the event that involves removing the mean background velocity, are discussed for three different lateral distances from the shore. This includes evaluation of the longitudinal and lateral velocity components and the turbulent shear stress at particular points between the barge and the shoreline.

Denoting the time-averaged x component of velocity by u and its fluctuation by u′, the following relations for three velocity components (u, v, w) can be written as

$$\mathbf{u} = \hat{\mathbf{u}} + \mathbf{u}', \mathbf{v} = \hat{\mathbf{v}} + \mathbf{v}', \mathbf{w} = \hat{\mathbf{w}} + \mathbf{w}' \quad \text{(1)}$$

The time-averaged velocities at a fixed point in space are given by

$$\hat{\mathbf{q}} = \frac{1}{T}\int_0^T \mathbf{q}\, dt, \quad \text{where } \mathbf{q} = (\mathbf{u}, \mathbf{v}, \mathbf{w}) \quad \text{(2)}$$

where T = duration of the background velocity or event; and the time-averages of all fluctuating components equal zero. Fig. 4 shows the periodic variation of turbulent fluctuating velocity components (u′, v′) and the shear stress ($-\rho\overline{u'v'}$) at a point 10.5 m from the shore when barge moves downstream at the McEver's Island site shown in Fig. 2(a). The x component of return flow beside the barge changes significantiy for both upstream and downstream traffic and increases in magnitudes by 0.2–0.6 m/s. This increase in velocity can last for 4–8 min and even 15 min near the shore before ambient flow conditions return. This longer time needed for the nearshore station to reach ambient flow conditions is a result of: (1) Chaotic water motion near the shoreline due to the irregular boundary; (2) amplified drawdown and waves in shallower water; and (3) the effects of the refraction and defraction of waves. This complex velocity behavior near the irregular boundary may also be due to the combined efforts of bowpush and propeller

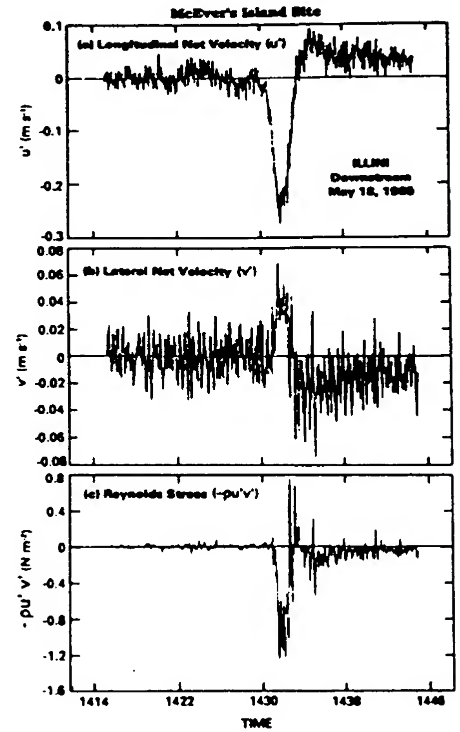

FIG. 4. Temporal Variations of Turbulent Fluctuating Velocities and Reynolds Stress for Downstream Barge

jet behind the barge tow. The lateral velocity (y component) increases, then decreases and becomes negative before reaching a stationary state. This indicates that for the downstream barge, fluid initially moves toward the shore and then back toward the sailing line [Fig. 4(b)]. The reverse seems to happen for upstream-bound events. The x component of the return flow can last longer than the y component beside the barge. The maximum velocity changes due to navigational traffic at this location can be as much as three to ten times the background mean velocity. The maximum velocities, durations of events, and turbulent shear stress generated by the barge movement mainly depend on barge dimension, river cross section, tow speed, draft, and the distance of the barge from the shoreline.

Cross-Sectional and Vertical Velocity Distributions

When the barge moves upstream, the natural flow condition is superimposed by the downstream components of return flow beside the barge, which result in increased velocity between the barge and the shore. When the barge moves downstream, the return flow beside the barge moves in the opposite direction to the ambient flow, and the overall velocity becomes zero near the midpoint between the barge and the shoreline and negative

near the shore. The fluid velocity at the boundary of the barge is assumed to be equivalent to the barge speed. At increasing distance from the barge, the fluid velocity decreases; that is, the dragging action exerted on the fluid particles farther from the barge gradually decays. Fig. 5 shows the cross-sectional variation of the longitudinal component of maximum net return flow velocity (removing the background mean) for a set of upstream and downstream events. These changes have been plotted against one-half the width of the river $y/(W_T/2)$ in one cross section. The return flow increases in the positive or negative directions due to the respective upstream and downstream movement of the barges. The effects of return flow for both cases are prominent, especially near the shore, creating higher turbulent shear and larger eddies. Fig. 5 also shows that velocity increases significantly at a point about 20% of the distance to the middle of the river (10% of the total width) and then decreases to zero at the midpoint between the shore and the boundary of the barge. The velocity distribution is parabolic in this zone. Because velocity data were not collected beyond this, they could not be presented in this figure.

The vertical distribution of mean background velocities (**u**, **v**) and the maximum return velocities due to the movement of navigational traffic were also analyzed for various barge configurations at a site on the Illinois River near Kampsville (the vertical station at the McEver's Island site had one meter malfunction). Velocity data were collected at three different heights (z), 0.20, 1.22, and 2.44 m above the bed. The depth of water at this location was 3.0 m. The current meters were located at a distance of 33.6 m from the shore, which was about 15% of one-half of the width of the river from the RDB. Data for two barge events, one moving upstream and another moving downstream, are presented in Fig. 6. For both events and background conditions, the figure shows that the vertical velocity distributions remained nonlinear and probably follow the logarithmic law. Moreover, the increasing velocities of the barge tow *Conti Karla*, moving upstream, remained fairly constant at all three levels. The magnitude of the increase was about 100%. This shows that in longitudinal velocities changes at all levels due to the movement of barge traffic, and that the increases in velocities

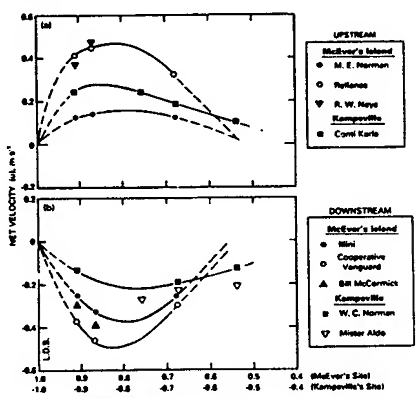

FIG. 5. Net Longitudinal Velocity Distributions due to Movement of Navigation Traffic

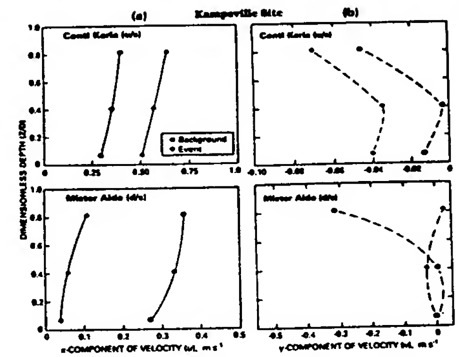

FIG. 6. Variations of Velocity with Depth before and during Upstream and Downstream Barge Movements; (*a*) Longitudinal Velocity; and (*b*) Transverse Velocity at the Kampsville Site

are fairly uniform. On the other hand, when the barge tow *Mister Aldo* was moving downstream, the return flow essentially decreased the main flow velocity from about 0.28 m/s near the bed to 0.03 m/s. At an elevation of 2.44 m above the bed, the velocity decreased from about 0.37 to 0.11 m/s. These changes in ambient velocities due to barge movement are quite dramatic and follow the basic concept that the return flow moves in the opposite direction of the barge.

Fig. 6(*b*) shows the variations in the lateral (y) component of the velocity for both barge tows, the *Conti Karla* and the *Mister Aldo*. For the *Conti Karla*, which was moving upstream, the lateral velocity increases at all levels in the vertical, indicating that the water moved toward the shore. The absolute magnitude of these velocity differences is approximately 0.02 m/s at all elevations. Note that the negative sign in the velocity scale indicates that flow is toward the shore.

The changes in the lateral velocities observed for the upstream movement of the barges at the Kampsville and McEver's Island sites are similar. A comparison of Fig. 6(*b*) (the *Conti Karla*) with similar data from the McEver's Island site has shown that at an equivalent distance from the shore and for both sites, upstream barge movement causes water to move laterally, essentially toward the shoreline. Thus, the actual behavior of the water movement is similar at both sites and at fixed distances from the shore or the centerline. This is extremely important, showing that the physical changes associated with the movement of barge traffic in large rivers are essentially similar, even though the absolute magnitudes of these changes may change for different river configurations.

Fig. 6(*b*) also shows the plot of transverse velocity changes in the vertical for the barge-tow configuration *Mister Aldo* moving downstream. Even at elevations of 0.2 and 1.22 m above the bed, no significant alterations in velocities occurred. But at an elevation of 2.44 m above the bed (z/D = 0.8), the magnitude of velocity decreases from about 0.32 m/s to zero. This indicates that for downstream barge movement, the transverse component of the velocity at a distance of about 15% of the half-width of the channel is essentially toward the centerline of the channel. This is exactly what was

observed for the barge tow *Illini* at the McEver's Island site at an equivalent distance from the shore.

The similarity in the altered velocity structures between the two sites, one 232 m wide (McEver's Island) and the other 330 m wide (Kampsville) indicates that the data and the subsequent analysis performed for each site may be transferred to other sites where field data are not available.

The cross-sectional variation of transverse fluctuating velocity v' generated by the upstream and downstream barges has also been analyzed. For the upstream barge, transverse velocity v' decreases near the shore, indicating the movement of fluid toward the sailing line. Then it increases at a distance of 15% of the half-width from the shore due to the fluid movement toward the shore. Again, for the downstream barge, the transverse velocity

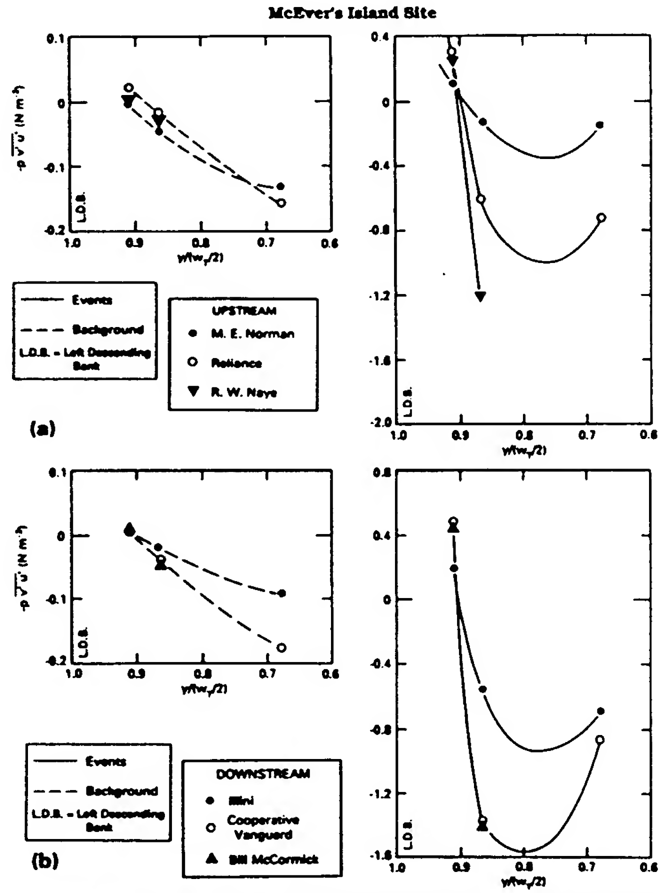

FIG. 7. Lateral Reynolds Stress Distributions before and during Series of Events at McEver's Island Site

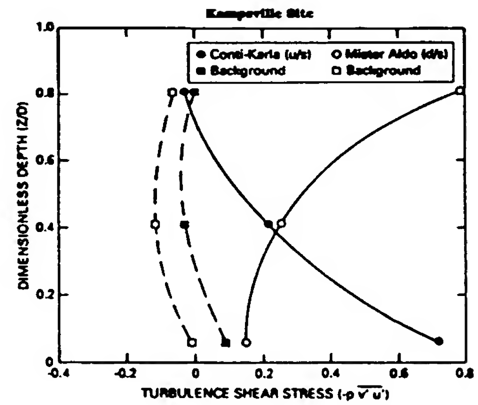

FIG. 8. Vertical Variations of Reynolds Stress for Longitudinal Component of Velocity: Background and Events

(v') increases near the shore and then decreases, which means that water moves toward both the shore and sailing line. Therefore, at a particular instant, fluid can be stretched toward the shore and toward the sailing line due to the movement of barge traffic.

Reynolds Stress Distribution

Time-averaged Reynolds stress or turbulence shear stress is defined by

$$\tau_{xy} = -\rho\overline{u'v'} = -\rho\frac{1}{T}\int_0^T u'v'\,dt \quad \text{(3)}$$

which can be interpreted as the transport of x momentum through a surface normal to the y-axis. Fig. 7 shows the variation of turbulent shear stress distributions ($-\rho\overline{u'v'}$) averaged over the duration 10–15 min before the barge passage and over the duration of the disturbance (event) generated by each barge against one-half of the river's cross section $y/(W_T/2)$ for three upstream- and three downstream-bound barges. The Reynolds stress distribution averaged over the duration of the background velocity varies approximately linearly with the distance from the shore, whereas during the events it varies nonlinearly with distance from the shore. The qualitative behavior of Reynolds stress distribution can be compared with distributions measured in closed channels or in wind tunnels (Schlichting 1966; Hinze 1975). There is also a close similarity with the corresponding results obtained in boundary layer flow. The correlation coefficient, ψ, between the longitudinal and transverse fluctuation at the same point can be defined as [Schlichting (1966) page 533]

$$\psi = \frac{\overline{u'v'}}{\sqrt{\overline{u'^2}}\sqrt{\overline{v'^2}}} \quad \text{(4)}$$

The existence of an apparent shearing stress due to velocity fluctuations always implies a correlation between the turbulent velocity components in two different directions. Fig. 7 shows that the turbulent shear stress reaches

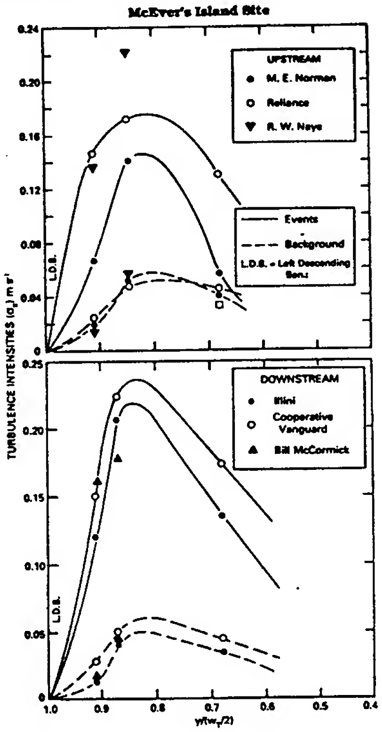

FIG. 9. Lateral Variations of Turbulence Intensities for Upstream and Downstream Barge Movement: Background and Events

to maximum value at $y/(W_T/2) \cong 0.8$ and then decreases to almost zero in the central zone between the bank and the barge where the turbulent fluctuations decay. The maximum Reynolds stress generated by the movement of navigational traffic is as much as ten times larger than the background velocity. And the movement of barge traffic in a river appears to generate larger eddies and more transverse turbulence shear than the background flows. As there is a linear variation in Reynolds stress for the background velocity, the transfer of energy takes place from the higher shear zone to the lower one.

Fig. 8 shows the vertical variations of the time-averaged Reynolds stress $(-\rho\overline{u'v'})$ for the background velocity and two events, one upstream and one downstream barge movement of the Kampsville site. For the upstream barge, the turbulence shear stress is large near the bed and decreases to zero toward the water surface, which is consistent with the increment of depth (z/D), shown in Fig. 6. At the same time, for the downstream barge, the turbulence shear stress increases toward the surface, which is also consistent with the vertical variation of velocity due to barge events, as shown in Fig. 6.

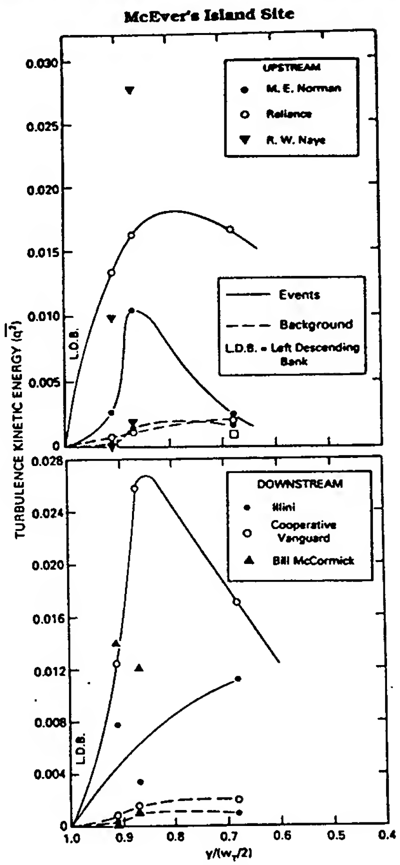

FIG. 10. Lateral Variations of Turbulent Kinetic Energy for Upstream and Downstream Events: Background and Events

Turbulence Intensities

The intensity of turbulence or standard deviation σ_x and σ_y, and the relative intensity of turbulence, σ_x/u and σ_y/v, were also computed and analyzed. The distributions of σ_x for both background velocity and barge event have been plotted in Fig. 9 against one-half width of the cross section of the river for six different barges moving upstream and downstream. The distribution of longitudinal turbulence intensity for both upstream- and downstream-bound barges is similar, whereas the distribution of transverse turbulence intensity for the upstream and downstream barges is somewhat different. The intensities of the two turbulence velocities, one for the event and the other for the background, differ appreciably from one another over the half-width of the river. Between 0.8 and 0.9 of $y/(W_T/2)$, the differences are substantial. However, the differences appear to decrease as one moves

either toward the shore or away from it from this range. The intensity of the longitudinal turbulent velocity component has a higher value than the transverse component, which is comparable to the closed-channel flow or the turbulent boundary layer near the wall (Hinze 1975).

An analysis of the variations of σ_x and σ_y with depth for background velocities and for events (the two upstream and downstream barges shown in Figs. 6 and 8) has shown that the turbulence intensities in both directions due to the movement of barges are higher than the background velocities for both upstream and downstream barges. The x component of turbulence intensities throughout the depth generated by the navigational traffic is as much as four times higher than the background velocity, which is almost uniform with depth.

Turbulent Kinetic Energy

Turbulent kinetic energy (TKE) per unit mass is defined by

$$\mathrm{TKE} = \frac{\overline{u'^2 + v'^2}}{2} \qquad (5)$$

The TKE distribution generated by the velocity changes across the half-width of the river $y(W_T/2)$ has been plotted in Fig. 10 for various upstream and downstream events. The TKE distribution for the background velocity averaged over 10–15 min before the barges passages is also shown. These variations in TKE are similar to those shown for the turbulence intensity. TKE increases, reaches a maximum value around 0.8–0.9 of $y/(W_T/2)$, and then decreases. It shows that the maximum TKE gathered by the velocity changes due to the barge passage is significantly higher than that for the background velocity. Thus, at a distance of 10–20% of the half-width of the channel from the shore, the TKE becomes highest for both the upstream and downstream barge events.

The analysis presented so far for the velocity and Reynolds stress distributions, including the turbulence intensities and TKE, indicates a significant difference in a large river before and during an event associated with the movement of barge traffic. The critical zone where changes in velocities, turbulence, and TKE occur is at a point about 10–20% of the distance from the shoreline to the half-width of the channel. Additional data collected by ISWS researchers are being analyzed now to quantify these changes and to develop methods for estimating these variations.

Conclusions

The movement of barge traffic in a restricted waterway such as the Illinois, Mississippi, or Ohio Rivers can change the velocity structure within the main channel and the channel border area. The changes of velocity (both x and y components) can last for 4–8 min and even 15 min near the shoreline before ambient conditions return. The x component of return flow can last longer than the y component in general. The return flow changes significantly for both upstream and downstream barge movement, increasing in magnitudes (in absolute value) by 0.2–0.6 m/s. These changes occur mostly within a zone of about 10% of the width of the river from the shoreline. The maximum velocity changes due to navigation can be as much as three to ten times the mean background velocity. The effects of return flow for both upstream and downstream barge movements are prominent, especially near the shore where higher turbulent shear and larger eddies are created.

An examination of vertical velocity distributions shows that the increased and decreased velocities for upstream and downstream barge movements, respectively, are quite measurable at all levels from the bed. The changes in velocities observed in the lateral direction for upstream and downstream barge movements at Kampsville are similar to those observed at McEver's Island.

The maximum turbulence shear stress generated by barge movement at a dimensionless distance of about 0.8–0.9 from the centerline of the channel is as much as 10 times higher than that averaged over the duration of background velocity. The movement of barge traffic in a river can generate larger eddies and more transverse shear than can natural flows in the river.

The qualitative behavior of axial turbulence intensity distribution for both upstream and downstream barges movements is similar, whereas the behavior of the transverse turbulence intensity is somewhat different. The intensity of the axial turbulence velocity component has a higher value than the transverse component. This is quite comparable to the turbulent boundary layer near the wall in a closed channel. In fact, the turbulence intensities following events in both axial and transverse directions are as much as four times higher than the background turbulence intensities.

The TKE generated by the event increases, reaches a maximum value between 0.8 and 0.9 of $y(W_T/2)$, and then decreases. This shows that the maximum TKE produced by the velocity changes is significantly higher than the background TKE in the natural river.

Acknowledgments

This research was done as a part of a project supported by the U.S. Army Corps of Engineers through the Environmental Management Program for the Upper Mississippi River System. Funding was provided through the Environmental Management Technical Center, Onalaska, Wisconsin. Ken Lubinski was the project manager. Many Water Survey staff assisted in the data collection and analysis of data: Rodger Adams, Bill Bogner, Jim Slowikowski, and Ed Delisio. The writers also thank the three reviewers for their excellent comments and suggestions.

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Appendix II. Notation

The following symbols are used in this paper:

D = local depth of river;
g = acceleration due to gravity;
h = water-level depression/drawdown;
$\mathbf{q}$ = velocity vector, $\mathbf{q} = (u, v, w)$;
T = duration of time period;
t = time;
$\mathbf{u}, \mathbf{v}, \mathbf{w}$ = velocity components;
$\mathbf{u}', \mathbf{v}', \mathbf{w}'$ = fluctuating velocity components;

$\hat{u}, \hat{v}, \hat{w}$ = time averaged velocities;
W_T = width of river;
x = axial coordinate;
y = lateral coordinate;
z = vertical coordinate;
ρ = density of water;
$-\rho\overline{u'v'}$ = turbulent shear stress;
σ_x, σ_y = turbulence intensities (x and y components); and
τ_{xy} = turbulent shear stress.

Return Flow in Rivers due to Navigation Traffic

By Nani G. Bhowmik,[1] Fellow, ASCE, Renjie Xia,[2] Associate Member, ASCE, Bijoy S. Mazumder,[3] and Ta Wei Soong,[4] Member, ASCE

INTRODUCTION

Movement of navigation traffic (barge-tows) in restricted waterways such as the Illinois or Mississippi Rivers can generate rapid return flow and water-level depression (drawdown) between the barge and the shoreline. Consequently, the velocity distribution in the zone between the barge and the shoreline changes temporarily in space and time. Many investigators have developed methods to compute the return velocity based on the concept of one-dimensional conservation of mass, momentum, or energy. Some investigators have also discussed methods of computing the return-velocity distribution across the channel between the barge and the shoreline. All the methods predict an exponential velocity distribution that decreases laterally with distance from the barge. However, from the field data, it has been observed that existing models do not exactly represent field conditions. The objective of the present study is to use existing models to compute the average return flow and the lateral return flow distribution, and compare them with the observed data to test the validity of these models.

RETURN FLOWS

Schijf and Jansen (1953) and Tothill (1966) developed the following equations to predict average return flow in connection with the movement of barge traffic in a narrow channel with a rectangular or trapezoidal cross section based on the conservation of energy and mass:

$$2gh = (u_s + u_{ar})^2 - u_s^2 \tag{1}$$

and

$$u_s A_c = (u_s + u_{ar})(A_c - A_m - W_T h) \tag{2}$$

where h = drawdown; u_s = barge speed; u_{ar} = average return velocity along the river flow direction; g = acceleration due to gravity; A_c = wetted cross-sectional channel area; A_m = average submerged cross-sectional area of the vessel; and W_T = top width of the channel

Sharp and Fenton (1968) and Bouwmeester (1977) developed methods to predict return flow beside the barge on the basis of one-dimensional momentum and continuity equations as

$$F_1 - F_2 - F_3 = \rho A_c(u_{rs} + \bar{U})(u_{rs} - \bar{U}) \tag{3}$$

and

$$A_c(u_{rs} + \bar{U}) = A_1(u_{rs} + u_{ar}) \tag{4}$$

where u_{rs} = barge speed with respect to bank; $\bar{U}$ = average ambient velocity; ρ = density of fluid; F_1, F_2, and F_3 = forces acting on a control volume of water; and $A_1 = W_T(D - h) - s(D^2 - h^2) - A_m$, where D = average water depth and s = slope of embankment expressed as tangent of bank inclination.

Blauuw and van der Knaap (1983) modified the Bouwmeester's method and developed the equations for the conservation of momentum and mass as

$$F_1 - F_2 - F_3 = \frac{\rho A_c(A_m + W_T h)u_s^2}{A_c - A_m - W_T h} \tag{5}$$

and

$$A_c u_s = A_*(u_s + u_{ar}) \tag{6}$$

where $A_* = A_c - A_m - W_T h$ is defined as the wetted cross-sectional area of the channel after drawdown minus area of midvessel section

Hochstein and Adams (1989) developed a method to directly compute average return flow u_{ar} as

$$u_{ar} = u_s\{[(a - 1)B + 1]^{0.5} - 1\} \tag{7}$$

where $a = [n/(n - 1)]^{2.5}$; and B = either $0.3e^{1.8(u_s/u_{cr})}$ for $u_s/u_{cr} \le 0.65$ or 1 for $0.65 < u_s/u_{cr} \le 1$, where $n = A_c/A_m$ and u_{cr} = the so-called first critical velocity, given by Hochstein (1967)

RETURN FLOW DISTRIBUTIONS

Hochstein and Adams (1989) assumed that the shape of lateral return flow distribution from the barge to the shoreline is exponential and is expressed by

$$u_r(y) = k_1 e^{-y/k_2} \tag{8}$$

where y = distance measured from the barge; $k_1 = \alpha u_{ar} d$; and $k_2 = W_s/\alpha[1 - e^{-\alpha F(\alpha)}]$, where d = barge draft, $F(\alpha) = 0.42 + 0.5 \ln \alpha$, W_s = distance from the barge to the shoreline, α = either 1 or $W_T/b \le 2.5$ or $0.114W_T/b + 0.715$ for $W_T/b > 2.5$, and b = beam width of barge.

Simons et al. (1981) used the one-dimensional velocity equation proposed by Hochstein (1967) to determine an exponential distribution of the return velocity from the barge to the shoreline as

$$u_r(y) = \alpha u_s(\sqrt{a} - 1)e^{-k(y)} \tag{9}$$

where $k(y) = 1 + \alpha^2 y e^{-\alpha F(\alpha)/W_s}$.

Berger et al. (1981) determined an exponential variation of the return velocity from the barge to the shoreline as

$$u_r(y) = u_{r,max}e^{-y/k_2} \tag{10}$$

where $u_{r,max}$ = average local maximum return velocity over the depth beside the barge recommended by Fuehrer and Römisch (1977).

More recently, Maynord and Siemsen (1991) developed an exponential equation to compute the cross-sectional return velocity distribution from the tow to the shoreline as

$$u_r(y) = u_{rsm}e^{C(y-b)/(W_s-b)} \tag{11}$$

where $C = 1.2[0.024(2A_{side}/A_m) - 0.266]$; and $u_{rsm} = u_{rside}[0.024(2A_{side}/A_m) + 0.734]$, where A_{side} = cross-sectional area of the river from the centerline of the tow to the

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shoreline, $u_{rside} = u_{ar}[0.36(A_c/2A_{side}) + 0.64]$, and u_{ar} = average return velocity computed by using Schijf and Jansen's (1953) equation.

FIELD DATA COLLECTION

Field data were collected from the Illinois River at river mile 35.2, near Kampsville. The average width of the river at this location is about 320 m during the data collection period. The river flow characteristics are presented in Table 1. Fig. 1 shows a schematic diagram of this site and relative locations of two-dimensional electromagnetic current meters (Marsh-McBirney, Inc., models MMB511 and MMB527) used to collect field data. The current meters were programmed to continuously measure x and y components of flow velocity at a rate of one sample per second. The x-axis is along the longitudinal direction of the river and positive in the downstream direction. The y-axis is perpendicular to the sailing line and positive toward the right bank of the river. Data from six upstream and five downstream bound barges (total of 11 events) were used in this study. Characteristics of these events are given in Table 2, in which vessel speed is relative to the streamflow.

TABLE 1. River Flow Characteristics

(1)	10/10/90 (2)	10/15/90 (3)	10/18/90 (4)
Q_w (m³/s)	413	772	817
$\bar{U}$ (m/s)	0.36	0.58	0.61
D (m)	3.44	3.64	3.91

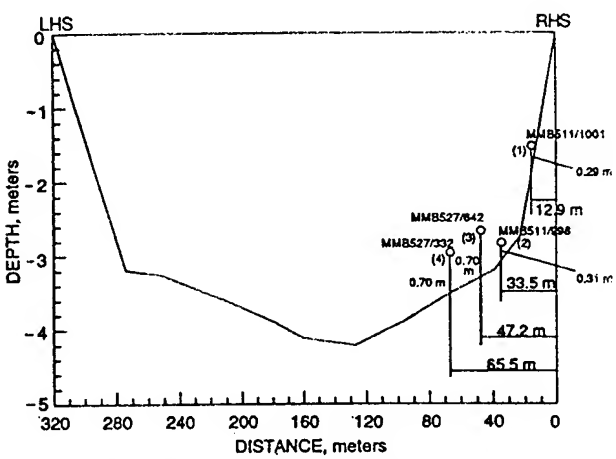

FIG. 1. Field Site on Illinois River at Kampsville and Relative Locations of Two-Dimensional Electromagnetic Current Meters

TABLE 2. General Barge-tow Information

Barge name (1)	Direction (2)	Configuration (3)	Speed (m/s) (4)	Draft (m) (5)	Distance from right bank (m) (6)
Sugarland	upstream	3 × 4	2.25	2.29	168
Conti Karla	upstream	3 × 5 + 1	2.05	2.35	143
Mr. Lawrence	upstream	3 × 5	2.92	1.74	168
Charles Lehman	upstream	3 × 4 + 1	2.20	2.74	143
Nicholas Duncan	upstream	3 × 3	1.89	2.74	130
Mr. Paul	upstream	3 × 5	2.81	1.62	130
Mr. Aldo	downstream	2 × 1 + 3 × 4	2.36	2.74	130
William C. Norman	downstream	3 × 4	2.54	2.74	137
Rambler	downstream	3 × 4	2.09	2.74	147
Ardyce Randall	downstream	3 × 5	1.96	2.74	143
Margaret O.	downstream	3 × 4	3.48	2.04	130

VELOCITY ALTERATION

Mazumder et al. (1991, 1993) and Bhowmik and Xia (1993) discussed the turbulence characteristics of ambient velocity and compared them with those generated by barge-tow passage within the channel border area of a natural river. These analyses have shown that various turbulence parameters do increase and a return current in the direction opposite the barge motion is generated during barge-tow passages.

Figs. 2 and 3 show the temporal variations of turbulent fluctuating velocity components u' and v', that is, return velocity components u_r and v_r, for an upstream (*Nicholas Duncan*) and a downstream bound barge (*Mr. Aldo*), respectively. An 11-point moving average technique was used to smooth out the fluctuations of the velocities. The selection of the 11-point moving average was done by experimenting with the data either to smooth out the fluctuations or to preserve the peak values of the velocities. The values of u_r and v_r can be determined by subtracting the ambient mean velocities $\bar{u}$ and $\bar{v}$ from the measured flow velocities u and v, respectively. The data shown in Figs. 2 and 3 are taken from a current meter installed 33.5 m from the shoreline at an elevation 0.31 m above the bed.

From Figs. 2 and 3, the effects of an event are either to increase the longitudinal return velocity u_r for upstream-bound barges or decrease it for downstream-bound barges. There is

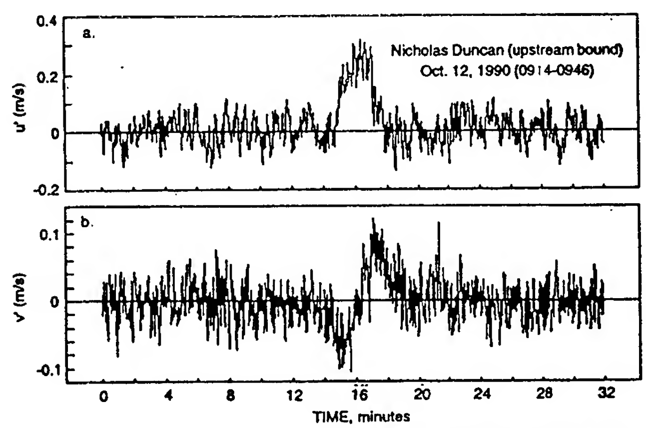

FIG. 2. Return Velocity Changes during Upstream Barge Movements: (a) Longitudinal; (b) Lateral

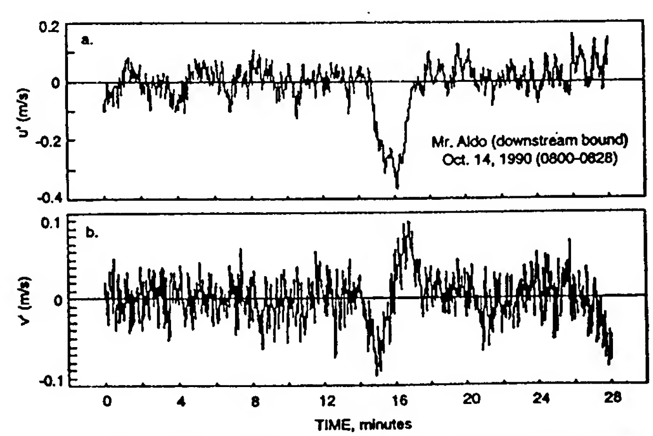

FIG. 3. Return Velocity Changes during Downstream Barge Movement: (a) Longitudinal; (b) Lateral

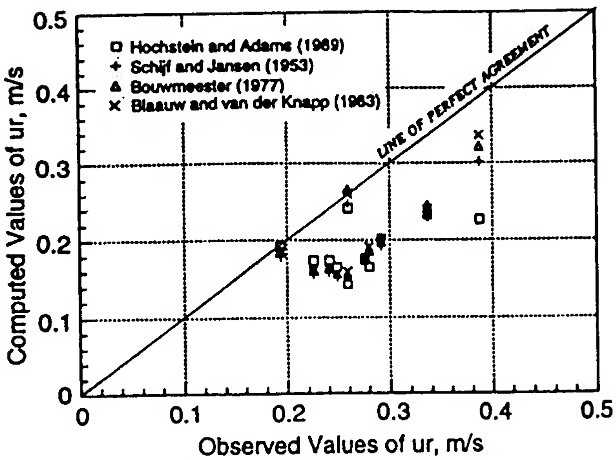

FIG. 4. Computed and Measured Values of Average Return Velocities

a maximum or minimum value of u_r for an upstream or downstream bound barge [see Figs. 2(a) and 3(a)], which actually reflects the maximum impact of the barge passage on the flow-velocity structure. Analysis of the lateral return velocity v_r shows the presence of a somewhat rotating flow field [see Figs. 2(b) and 3(b)]. This is because there is a change in the direction of the lateral velocities during an event. This study only considers the u_r related to the maximum impact of the navigation traffic in order to compare the field data with the existing return flow models.

AVERAGE RETURN VELOCITY

Four existing models (Schijf and Jansen 1953; Bouwmeester 1977; Blauuw and van der Knaap 1983; and Hochstein and Adams 1989) can be used to predict the average return velocity. In this analysis, return velocities measured at all data collection locations at the Kampsville site on the Illinois River for each event were averaged to obtain an average return velocity within the width between the barge and the shoreline. These average return velocities for all 11 events were compared with the predicted average return velocities computed from the four existing models. These results then are shown in Fig. 4. Examination of this figure shows that all the methods proposed by the previous investigators tend to underestimate the average return velocity and this underestimation can reach up to about 30%.

LATERAL DISTRIBUTION OF RETURN VELOCITY

The variation of flow velocity from the barge to the river bank is also important for any study on the physical changes due to navigation traffic. The methods proposed by Simons et al. (1981), Berger et al. (1981), Hochstein and Adams

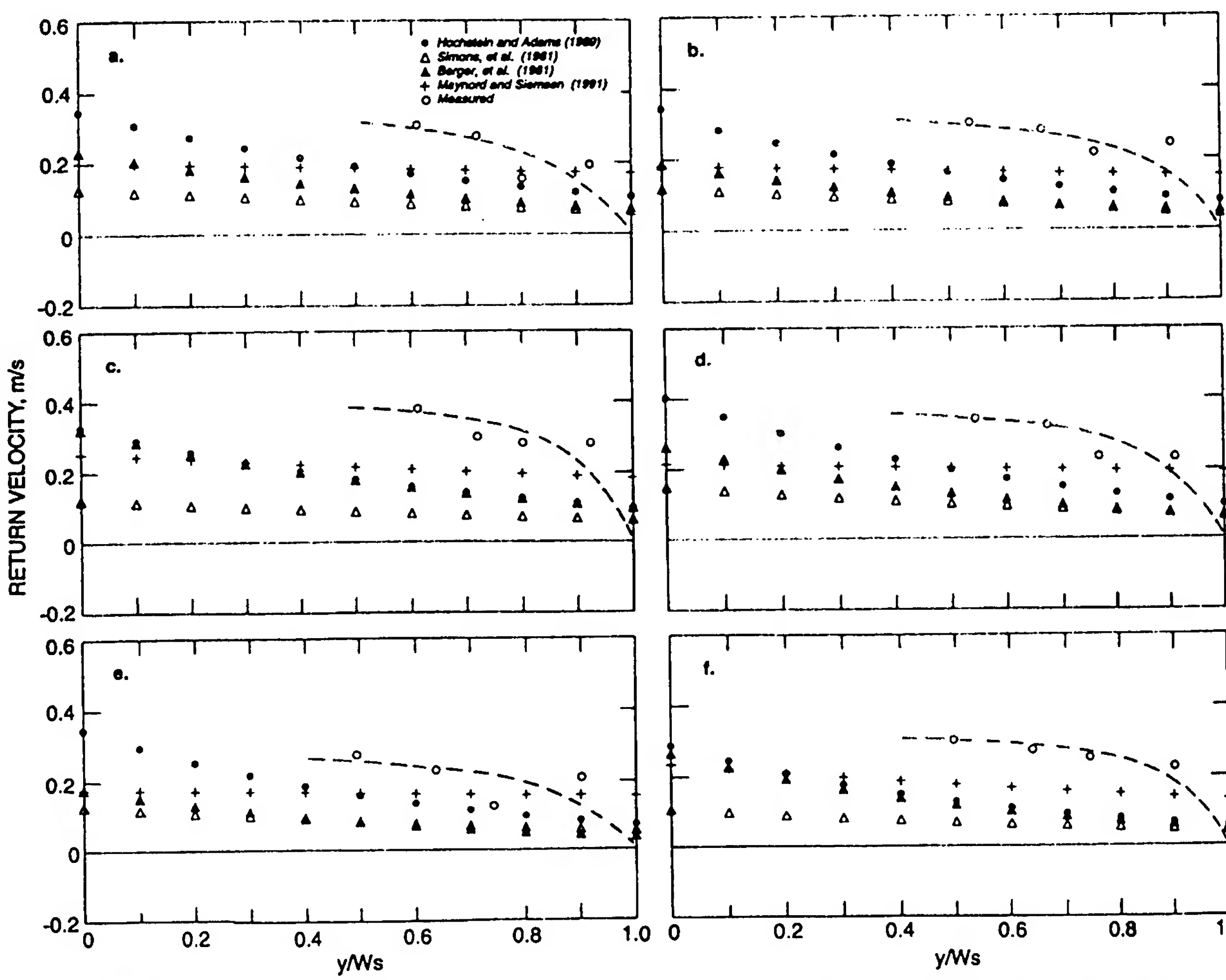

FIG. 5. Comparison between Computed and Measured Lateral Velocity Distribution for Upstream Bound Barges: (a) *Sugarland*; (b) *Conti Karla*; (c) *Mr. Lawrence*; (d) *Charles Lehman*; (e) *Nicholas Duncan*; (f) *Mr. Paul*

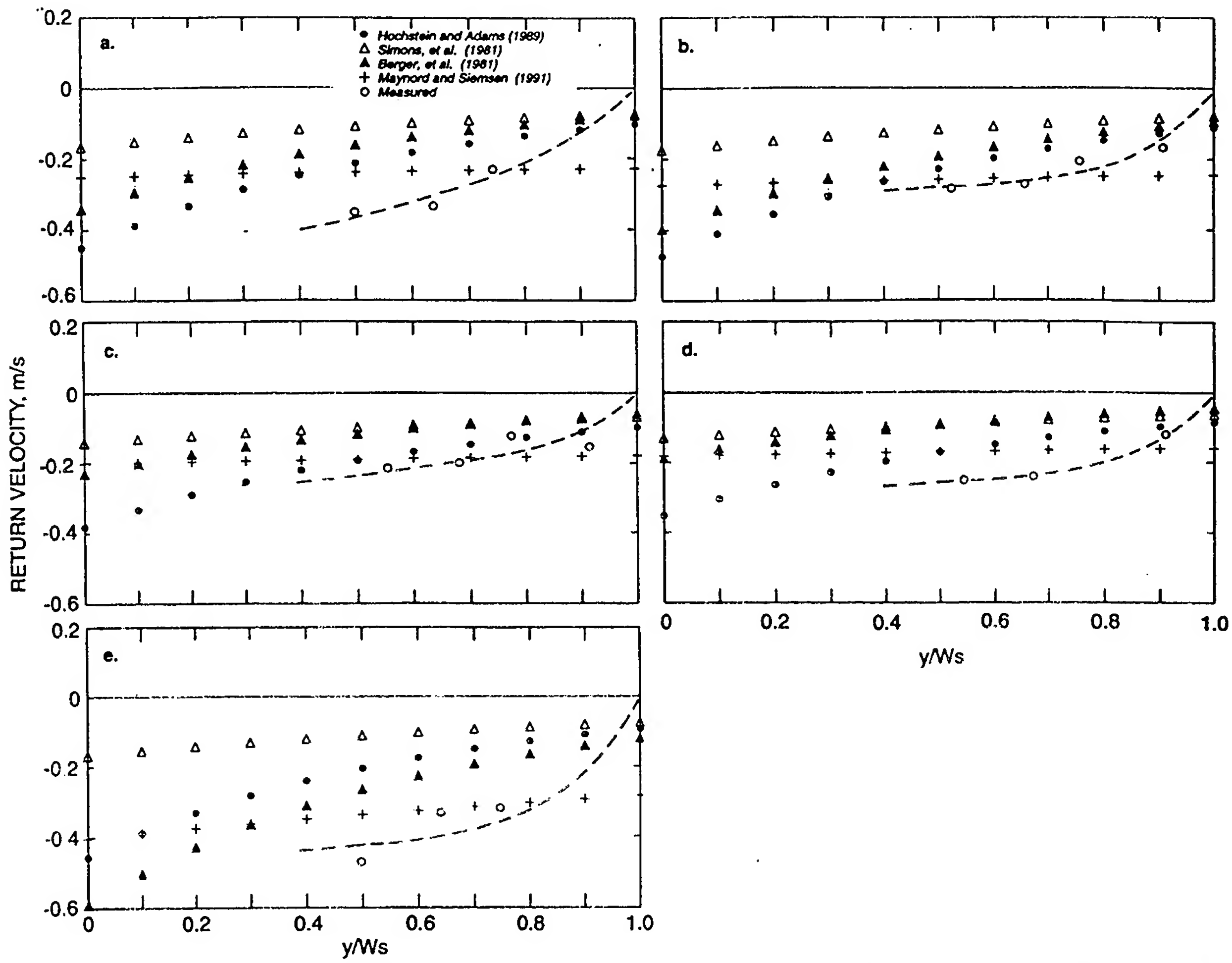

FIG. 6. Comparison between Computed and Measured Lateral Velocity Distribution for Downstream Bound Barges: (a) *Mr. Aldo*; (b) *William C. Norman*; (c) *Rambler*; (d) *Ardyce Randall*; (e) *Margaret O*

(1989), and Maynord and Siemsen (1991) can be used to determine the shape of the lateral return flow distribution. In all of these methods, predicted return velocity distributions decrease exponentially with distance from the barge to the shoreline. However, the field data collected from the Illinois River show a different lateral distribution of the return flow.

Figs. 5 and 6 show the predicted (dashed line) and measured lateral return velocity distributions for six upstream and five downstream bound barges. An examination of these plots for the 11 events shows that none of the existing models correlates well with the field data. For either the upstream or downstream bound barges, the return flow generated by barge-tows increases with distance from the shoreline and appears to have a parabolic-like distribution in the lateral direction. All the existing models underpredict the magnitude of the return velocities within the zone where velocity data were collected in the field for the present project.

CONCLUSIONS

Movement of navigation traffic in natural rivers is normally associated with a set of physical changes, including a return current and altered vertical and lateral velocity regimes. The changes of flow-velocity structure are important in the evaluation of sensitive biologist habitats within the channel border areas. Many investigators have developed methods to predict the return flow. However, a comparison of these methods with field data shows that the existing models do not predict the return flow that well.

In this analysis, it was found that all the existing models underestimate the average return flow velocity by as much as 30%. It was also found that the exponential return flow distribution across the width between the barge and the shoreline described by the existing models are not supported by the field data. An examination of the field data indicates that the return flow due to the movement of navigation traffic may have a parabolic-like distribution. Therefore, it may be necessary to develop a more realistic model to predict the return flow in natural rivers due to the movement of navigation traffic.

ACKNOWLEDGMENTS

This research project was partially supported by the U.S. Army Corps of Engineers and the National Biological Service (NBS) through the Environmental Management Program for the UMRS. The project was administered by the NBS Environmental Management Technical Center, Onalaska, Wisconsin, with Ken Lubinski at the Project Director. Many Illinois State Water Survey staff assisted in field-data collection and processing of the data, including Rodger Adams, Bill Bogner, Jim Slowikowski, and Ed Delisio. The writers express sincere thanks to all of them for the outstanding efforts in this endeavor.

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APPENDIX II. NOTATION

The following symbols are used in this paper:

A_c = wetted cross-sectional channel area;
A_m = average submerged cross-sectional area of vessel;
A_{side} = cross-sectional area from tow centerline to shoreline;
a = ratio of cross-sectional areas;
B = empirical parameter;
b = vessel beam;
D = average depth of water;
d = vessel draft;
F_1, F_2, F_3 = forces acting on control volume of water;
g = acceleration due to gravity;
h = water-level depression (drawdown);
k_1, k_2 = constrainment factors;
Q_w = flow discharge;
s = slope of embankment;
$\bar{U}$ = average ambient velocity;
u, v = velocity components;
u', v' = fluctuating velocity components;
$\bar{u}, \bar{v}$ = time average velocity components;
u_{ar} = average return velocity along flow direction;
u_{cr} = critical velocity;
u_r, v_r = return velocity components;
u_{rs} = vessel speed with respect to bank;
u_s = vessel speed;
W_s = lateral distance from vessel to bank;
W_T = top width of river;
α = correction factor; and
ρ = density of water.

Distribution of turbulent velocity fluctuations in a natural river

Distribution des fluctuations de vitesse turbulente dans une rivière naturelle

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SUMMARY
Turbulent characteristics of flow velocity in a natural river were systematically analyzed in this study. Flow velocities were measured with time at six different lateral locations and at three different vertical elevations on a major navigable waterway in the United States. Analyses of the velocity data include the cross-sectional and vertical distributions of longitudinal and transverse velocity components (u, v), the fluctuating velocity components (u', v') and their frequency-distribution curves, turbulent intensities (σ_x, σ_y), and turbulent shear stress $(-\rho\overline{u'v'})$. These analyses have shown that the strongest velocity fluctuation occurs near the main channel area above the river bed.

RÉSUMÉ
Cet article analyse systématiquement les caractéristiques turbulentes de la vitesse d'écoulement dans une rivière naturelle. Les vitesses d'écoulement ont été enregistrées en fonction du temps en 6 positions différentes sur la largeur et à trois profondeurs d'une des principales voies navigables des USA. Les analyses des mesures de vitesse comprennent les distributions horizontale et verticale des composantes longitudinale et transversale du vecteur vitesse (u, v), les composantes fluctuantes (u', v'), leurs spectres de distribution d'énergie, leurs intensités turbulentes (σ_x, σ_y) et leurs contraintes de cisaillement turbulentes $(-\rho\overline{u'v'})$. Ces analyses ont montré que la plus importante fluctuation de vitesse est observée au voisinage du chenal principal à la verticale du lit de la rivière.

1 Introduction

When flow at a high Reynolds number moves between fixed boundaries, the longitudinal and transverse components of flow velocity, as well as the normal and tangential stresses, must be expected to fluctuate with time and space. Although these nonperiodic fluctuations are generally secondary in magnitude compared to the mean motion, they have profound effects on properties of the primary mean motion. Over the years several experimental studies have been performed using

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various techniques [10,11,12,13] in order to understand the mean flow and turbulent characteristics of open channel flow. Recently, the use of Laser Doppler Anemometers has also greatly advanced the investigation of turbulent structures in compound channels [7] and submerged hydraulic jumps [8]. However, turbulence and shear stresses in natural river systems are elusive subjects, and they have not yet been studied in great detail [1,2,3,5,6,15]. Scientists from the Illinois State Water Survey have been involved in collecting and analyzing detailed velocity data from a large river system using 2-D electromagnetic current meters. The goal of this research is to understand the turbulent velocity structure in natural river systems, especially near the channel border areas. An understanding of turbulence in natural rivers is important for the sediment transport, bank erosion, and evaluation of biological habitats as they relate to the physical and hydraulic characteristics of a river.
The present investigation is aimed at presenting and identifying the temporal fluctuations of velocity components and turbulent shear stress for natural river flow. It addresses cross-sectional and vertical variations of velocity components (u, v), velocity fluctuation components (u', v'), turbulent intensities (σ_u, σ_v), and turbulent shear stress ($-\overline{\rho u'v'}$).

2 Equipment and data collection

A site-specific field study was conducted to investigate changes of velocity and turbulent shear stress in the Illinois River, a large natural river. Figure 1 shows a schematic diagram of the field set-up used in this investigation on the Illinois River at Kampsville, river mile (RM) 35.2. The x-axis is the longitudinal direction of river flow; y-axis is perpendicular to the sailing line, with the positive direction toward the left-hand side (LHS) of the river; and z-axis is normal to the xy-plane. The origin is set at the right-hand side (RHS) of the river. This study is part of a major research undertaking focusing on changes in hydrodynamic characteristics of the Upper Mississippi River System (UMRS) due to navigation traffic (the Illinois River is part of the UMRS). The present paper will concentrate on the turbulent characteristics of natural rivers without considering external disturbances such as the movement of navigation or recreational traffic.

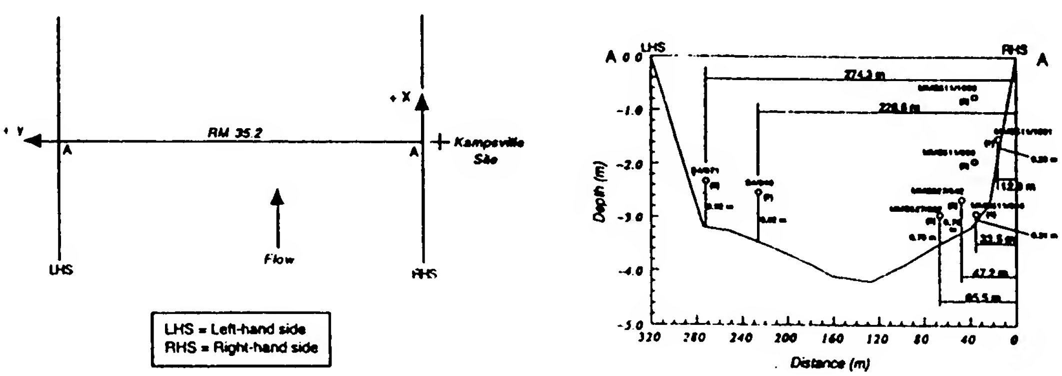

Fig. 1. Schematic diagram showing the data collection set-up on the Illinois River at Kampsville.

Velocity data were collected using eight 2-D electromagnetic current meters (six Marsh McBirney MMB511 and MMB527 meters and two Inter Ocean S4 meters). The relative locations of these meters are also shown in Figure 1. Current meters MMB511, MMB527, and S4 have spherical sensors of 3.9, 10.3, and 25.0 centimeters, respectively. All the meters have four probes and separate housings for electronics. The signal processing unit in each meter provides visual readings for the

x and y components of flow velocity. The accuracy and basic capabilities for these meters are presented in table 1. Figure 2 shows one MMB527 meter, along with a panoramic view of the field site.

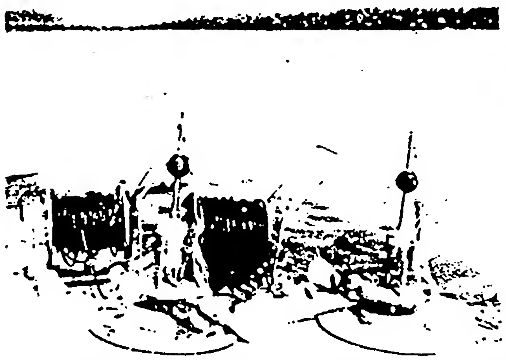

Fig. 2a. MMB527 meter used in the field.

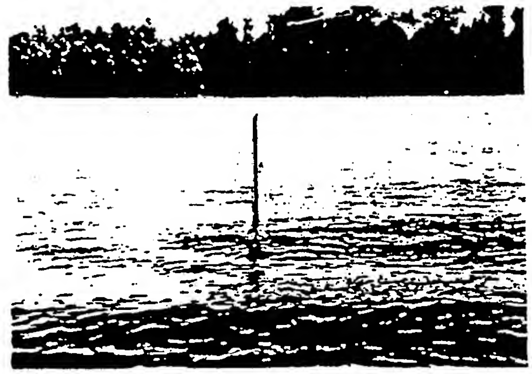

Fig. 2b. Panoramic view of the field set-up.

The x and y components of flow velocity (u, v) were continuously measured with time by two MMB511, two MMB527, and two S4 current meters at six lateral locations at distances of 12.9, 33.5, 47.2, 65.5, 228.6, and 274.3 meters (m) from the RHS of the river. The six meters were located at depths from 0.29 to 0.92 m above the river bed to measure the velocity fluctuation close to the bed in the cross-sectional direction. Three MMB511 current meters were also mounted at three vertical heights of 0.31, 1.22, and 2.44 m above the river bed, at a lateral distance of 33.5 m from the RHS. The three meters were used to detect the variations of velocity fluctuation in the vertical direction. To show real variations of flow velocity both in the lateral and vertical directions, the ideal approach would be to install a series of current meters (about 40 to 50) along a river cross section, and then draw isovels based on data measured. However, in the field conditions, this approach was not feasible because it required a substantial amount of money and personnel. In this study, velocity data were collected at the rate of one sample per second to study the turbulent velocity fluctuations.

Table 1. Meter specifications

Meter	Manufacturer	Parameters	Range	Accuracy
MMB527	Marsh McBirney	u,v direction	+300 cm/sec 0–360°	+2% of reading
MMB511	Marsh McBirney	u,v direction	+300 cm/sec	+2% of reading
S4	Inter Ocean	u,v direction depth temperature conductivity	0–350 cm/sec 0–360° 0–70 m –5–45°C 1–70 mS/cm	0.2 cm/sec 0.5° 4 mm 0.5°C 0.1 mS/cm

3 Analysis of velocity data

The longitudinal and transverse components of flow velocity (u, v), turbulent intensities (σ_x, σ_y), and turbulent shear stress $(-\rho\overline{u'v'})$ were computed to better understand the turbulent velocity fluctuations in natural rivers. The velocity data were collected on three consecutive days (October 13 through 15, 1990). Four time slots were selected during which disturbances due to navigation or recreational traffic were absent:

Date	Time	Flow discharge, Q (m^3/s)
October 13	1230–1330	732.5
October 14	1345–1445	758.6
October 15	1100–1200	771.7
October 15	1230–1330	776.0

The one-hour time interval was selected based on an evaluation of the turbulent velocity fluctuations (to be described later). The 60-minute duration essentially eliminates the variability due to short-term natural fluctuations in velocity within a river.

The temporal variations of longitudinal and lateral velocities and turbulent shear stress at any particular point in the river are of equal importance to those variations in space. The variation of velocities with time indicates acceleration, and the variation of turbulent shear stress with time indicates the transfer of momentum. These changes generate secondary currents and eddies. Denoting the instantaneous flow velocity into two parts, a time-averaged component and a fluctuating component, the relationships for the three velocity components (u, v, w) can be written:

$$u = \bar{u} + u'; \qquad v = \bar{v} + v'; \qquad w = \bar{w} + w' \tag{1}$$

The time-averaged component at a fixed point in space is given by:

$$\bar{A} = \frac{1}{T}\int_{t}^{t+T} A\,\mathrm{d}t \qquad (\bar{A} = \bar{u} \text{ or } \bar{v} \text{ or } \bar{w}) \tag{2}$$

where T must be a relatively longer time in comparison to the time scale of turbulence. Under the given time interval, T, the time-averaged value of the fluctuating component should be zero, i.e.:

$$\bar{A}' = \frac{1}{T}\int_{t}^{t+T} A'\,\mathrm{d}t = 0 \qquad (\bar{A}' = \bar{u}' \text{ or } \bar{v}' \text{ or } \bar{w}') \tag{3}$$

In order to determine the optimum time interval, T, the data collected during the four selected time slots were evaluated and tested. The values of u' and v' according to equation (3) were computed for each set of data for different time intervals. Figure 3 gives the results of the analysis of the data set for October 13, 1990, 1230 to 1330 hours. The time-averaged values of u' and v' normally stay high for time intervals of 5 to 20 minutes. After that, the values of $\overline{u'}$ and $\overline{v'}$ start to decrease asymptotically toward zero, and attain a value of about zero after 60 minutes. Similar variability and asymptotic natures were also observed for the other three time slots.

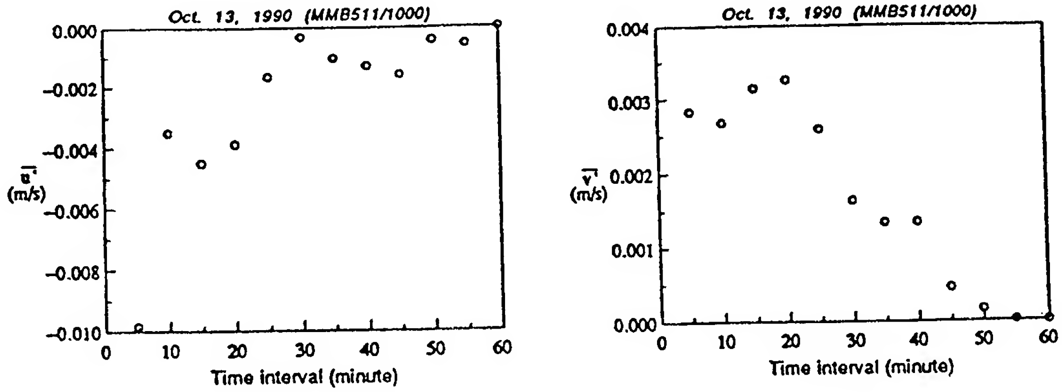

Fig. 3. Variations of $\overline{u'}$ and $\overline{v'}$ with time.

This analysis indicates that the 60-minute interval is probably quite appropriate for the determination of turbulent velocity fluctuations in large rivers such as the Illinois River.

Figure 4 shows the time series plots of flow velocity for the u and v components and their respective fluctuations, u' and v', for a period of 60 minutes for the October 13 data set. A comparison of the magnitude of u with that of v shows that the transverse velocity component v is much less than the longitudinal velocity component u. These differences are approximately one order in magnitude. This is normally expected in open channel flow where the overall motion of the flow is in the direction of the longitudinal x-axis.

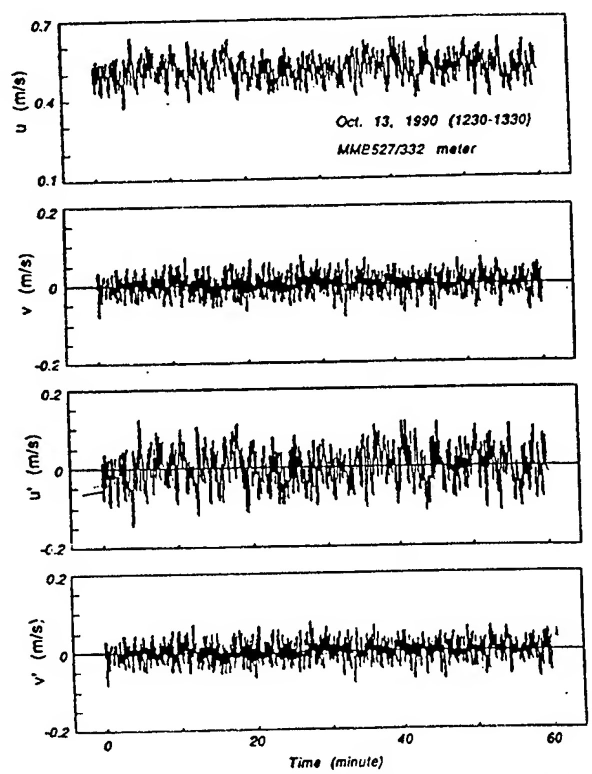

Fig. 4. Variations of measured u and v and u' and v' with time.

3.1 *Cross-sectional and vertical velocity distributions*

The longitudinal and transverse velocity components, each averaged over 60 minutes for four time slots on three consecutive days, have been plotted against the relative width (y/W) of the river in Figure 5, where y is the distance of each current meter from the RHS of the river and W is the cross-sectional top width of the river. This plot shows how the x and y components of time-averaged velocities change from one side of the river to the other and also with the flow discharge on each of the three days. The cross-sectional distribution of the time-averaged longitudinal velocity component, $\bar{u}$, which was measured from depths close to the river bed, shows that the maximum value of $\bar{u}$ occurs near the sailing line of the river and that its value gradually decreases toward the shoreline. On the other hand, the lateral distribution for the time-averaged transverse velocity component, $\bar{v}$, is irregular, and its magnitudes are one order less than those of $\bar{u}$.

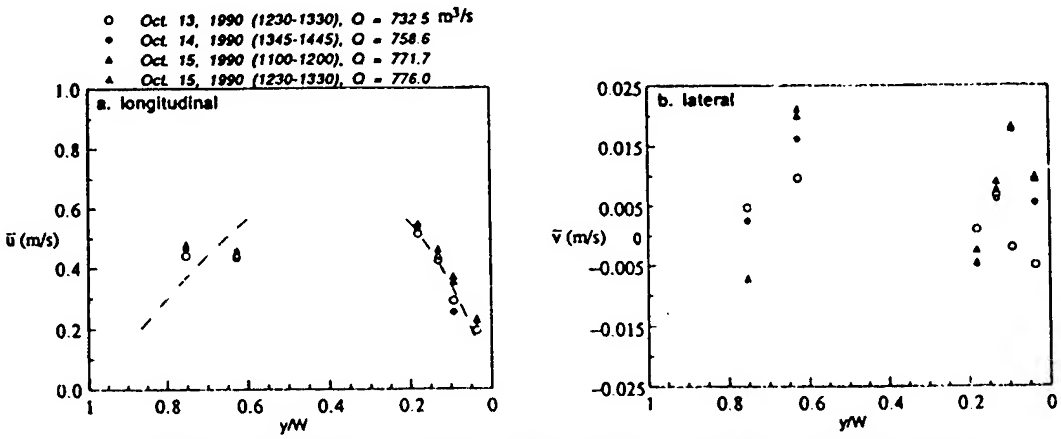

Fig. 5. Variations of time-averaged longitudinal and lateral velocities across the width of the river.

The river discharge for the three days varied from 732.5 cubic meters per second (m^3/s) to 776.0 m^3/s. However, the distribution pattern of $\bar{u}$ for the four different discharges does not change appreciably, indicating the existence of a stable flow pattern at this site. On the contrary, the variation of $\bar{v}$ with flow discharge seems more sensitive than that of $\bar{u}$. With increasing flow discharge, the variation in $\bar{v}$ increases.

The vertical variations of the time-averaged velocity components, $\bar{u}$ and $\bar{v}$, at a location of 33.5 m from the RHS of the river are shown in Figure 6 for the same three days and four time slots. The water depth at this location was 3.43 m, and the flow velocities were measured at heights of 0.31, 1.22, and 2.44 m above the river bed. This plot shows that the time-averaged longitudinal velocity component, $\bar{u}$, increases with depth toward surface. The distribution is approximately parabolic in nature. On the other hand, the magnitudes of the time-averaged transverse velocity component, $\bar{v}$, vary randomly with depth.

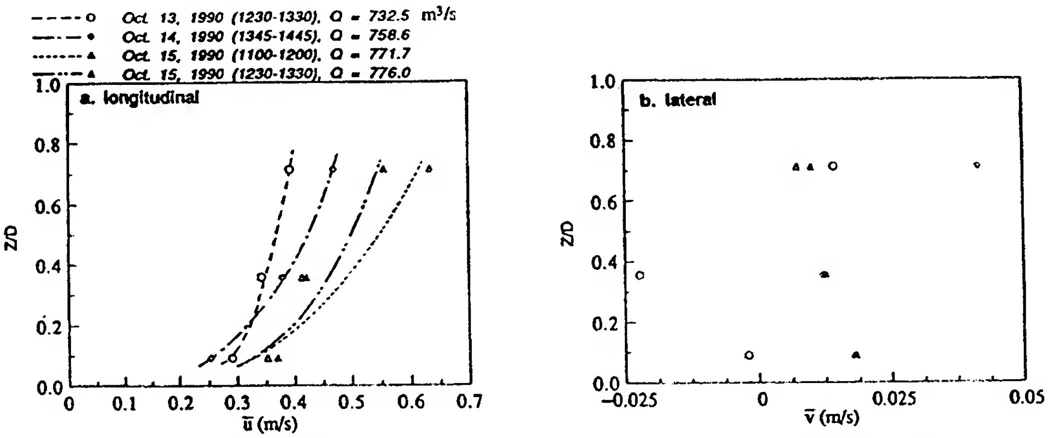

Fig. 6. Variations of time-averaged longitudinal and lateral velocities in the vertical direction.

3.2 *Variability of turbulent fluctuations across river width*

Fluctuations of flow velocity at any fixed location can be studied by developing a frequency-distribution curve of the differences between the instantaneous velocity and the mean velocity [14]. Since velocity data were collected at a rate of one sample per second and a 60-minute time interval was selected for the study of turbulent velocity fluctuations, there were a total of 3600 measurements for each 60-minute time slot. These 3600 data points were used to develop frequency-distribution curves for both u' and v'. Here, the frequency is defined as the number of occurrences of a certain value of u' or v' in 3600 measurements. This analysis, when applied to each measured point in a river cross section, can depict the strong or weak turbulent fluctuations of the flow velocity at different lateral and vertical locations.

Figure 7 shows such a set of frequency-distribution curves for the longitudinal velocity fluctuation, u', across the width of the river (RM 35.2) at six locations and over the depth at three elevations (see Figure 1) for the October 13 data set. When the measured values of u' ($u' = u - \overline{u}$) are small, their frequency distribution is clustered close to zero on the x-axis, indicating that the fluctuation is weak. Conversely, when the measured values of u' are large, their frequency distribution will spread out, indicating a strong fluctuation. Thus, Figure 7 indicates that the velocity fluctuation is relatively weak near the shoreline and quite strong near the main channel area of the river.

Figure 8 shows the variability of the frequency-distribution curves for the lateral velocity fluctuation, v', for the same eight points used in Figure 7. The distributions of these frequency plots are similar to those shown in Figure 7 for u'. The lateral velocity fluctuation is also quite small near the channel border areas compared to that near the main channel area. Thus, both Figures 7 and 8 indicate that turbulence is strong in the main channel near the river bottom and quite weak near the channel border areas.

Statistical parameters associated with these frequency-distribution curves are given in table 2 for the longitudinal and lateral velocity fluctuations, u' and v', across the width of the river and in the vertical direction, respectively. These statistical parameters indicate that the velocity fluctuations can be fitted by a normal (Gaussian) distribution and that the selection of the 60-minute time interval is correct since the mean values of u' and v' are almost equal to zero.

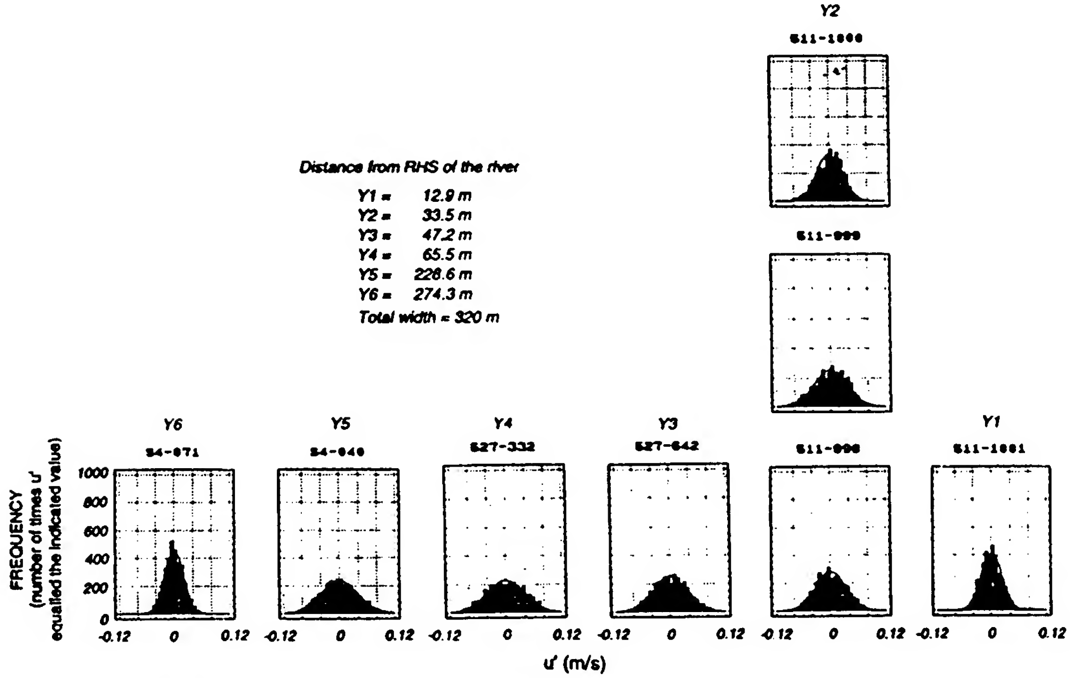

Fig. 7. Frequency distribution of longitudinal turbulent velocity fluctuation, u', in the river cross section

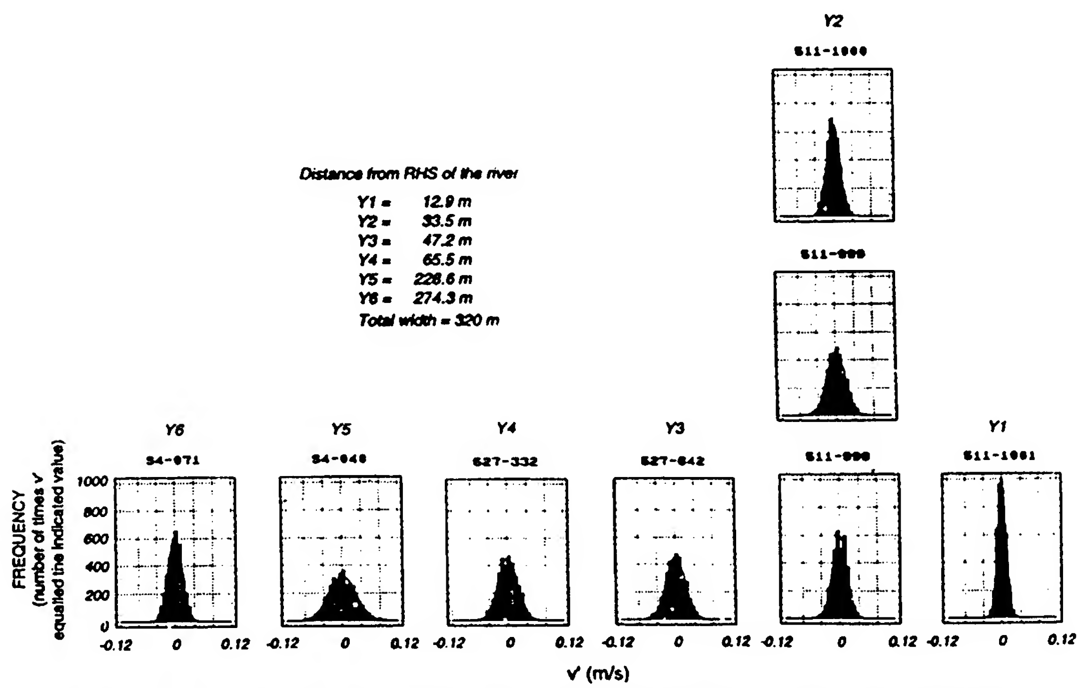

Fig. 8. Frequency distribution of lateral turbulent velocity fluctuation, v', in the river cross section.

Table 2. Statistical parameters for u' and v'
(a) Transverse direction

	Statistical parameters	Meter number S4/071	S4/040	MMB527/332	MMB527/642	MMB511/998	MMB511/1001
	mean	6E-07	9E-07	5E-07	3E-07	–1E-07	7E-07
u'	stand. dev.	0.021	0.041	0.042	0.038	0.034	0.023
	range	0.151	0.262	0.266	0.229	0.235	0.164
	skewness	0.09	0.11	–0.08	0.03	0.08	0.57
	mean	2E-08	2E-07	2E-07	4E-07	–8E-06	–2E-06
v'	stand. dev.	0.016	0.029	0.021	0.021	0.016	0.010
	range	0.110	0.293	0.156	0.148	0.124	0.069
	skewness	–0.12	0.11	–0.07	–0.09	–0.17	0.07

(b) Vertical direction

	Statistical parameters	Meter number MMB511/998	MMB511/999	MMB511/1000
	mean	-1E-07	6E-07	3E-07
u'	stand. dev.	0.034	0.037	0.028
	range	0.235	0.240	0.177
	skewness	0.08	-0.15	-0.34
	mean	-8E-06	-6E-06	6E-08
v'	stand. dev.	0.016	0.020	0.014
	range	0.124	0.156	0.104
	skewness	-0.17	-0.14	0.04

3.3 *Turbulent intensity*

The turbulent intensity or variance in the x-direction can be defined by the root-mean-square value of the x component u' as:

$$\sigma_x = \sqrt{\overline{u'^2}} = \left[\frac{1}{T}\int_t^{t+T} u'^2 \mathrm{d}t\right]^{1/2} \tag{4}$$

A similar expression can be written for the y component, σ_y.
The cross-sectional variations of turbulent intensity for both the longitudinal and lateral velocity fluctuation components (σ_x, σ_y) for the three days and four time slots are shown in Figure 9. Again, these values of σ_x and σ_y were averaged over 60 minutes. Figure 9 indicates that the maximum

magnitude of σ_x or σ_y occurs in the main channel area and that their magnitudes decrease gradually toward the channel border areas. The qualitative behaviors of the distributions of longitudinal and transverse turbulent intensities across the width of the river are similar, except that the magnitude of σ_y at any location is about 50 to 70 percent of σ_x.

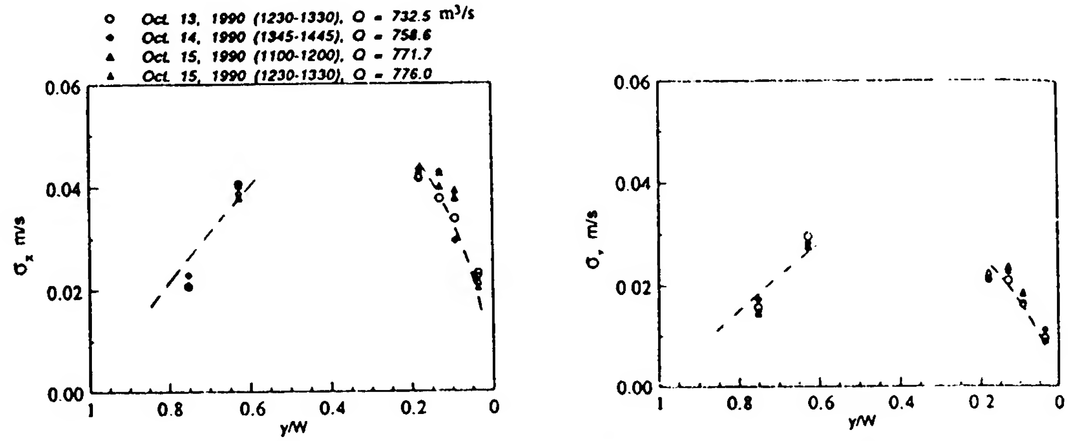

Fig. 9. Variabilities of turbulent intensities, σ_x and σ_y across the width of the river

The variability of σ_x across the width of the river is almost identical to that observed for u (see Figure 5). The similarity of the cross-sectional variability of u and σ_x also indicates that the flow, on average, is fairly stable at this reach.

Figure 10 shows the change in the values of σ_x and σ_y in the vertical direction for the same four time slots. In general, turbulent intensity increases from the surface toward the bottom, with a sharp increase at an elevation of 10 to 20 percent of the depth from the bed; then it decreases asymptotically closer to the bed. As expected, Figure 10 shows that turbulent intensity is likely highest at an elevation of 10 to 20 percent of the depth from the river bed.

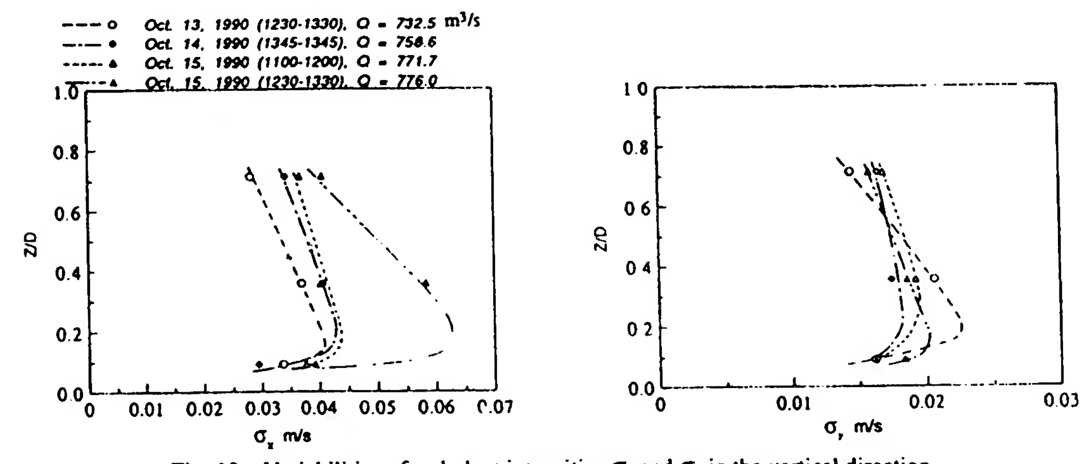

Fig. 10. Variabilities of turbulent intensities σ_x and σ_y in the vertical direction

3.4 *Turbulent shear stress*

For two-dimensional turbulent flow, turbulent shear stress or Reynolds stress is defined as:

$$\tau_{xy} = -\rho\overline{u'v'} = -\frac{\rho}{T}\int_{t}^{t+T} u'v'dt \tag{5}$$

which can be interpreted as the transport of x-momentum through a surface normal to the y-axis [4,9]. Data collected from this research were used to compute the instantaneous turbulent shear stress, $-\rho u'v'$. Figure 11 shows the variations of $-\rho u'v'$ with time at six locations across the width of the river (see Figure 1) for the October 13, 1990, data set. This Figure illustrates that the magnitudes of $-\rho u'v'$ are relatively small near the river bank in the channel border areas compared to those measured far from the bank. Similar results were also observed for other flow discharge conditions.

The cross-sectional variation of the time-averaged turbulent shear stress, $-\rho\overline{u'v'}$, for four time slots on the three days, has been plotted in Figure 12(a) against the relative width of the river. Note that the absolute magnitude of $-\rho\overline{u'v'}$ decreases toward the shoreline, which indicates that the transfer of the x component of the momentum normal to the y-axis is higher in the area away from the river bank. Also note that the turbulent shear stress in Figure 12(a) has different signs in the left and right halves of the river and must go through zero somewhere in the middle of the river where the time-averaged longitudinal velocity component, $\overline{u}$, has a maximum magnitude and hence zero gradient. Since it is impossible to gather velocity data from the central part of the river due to heavy commercial navigation traffic, Figure 12(a) could not display this location for the zero turbulent shear stress; however, it is certain to occur at this location.

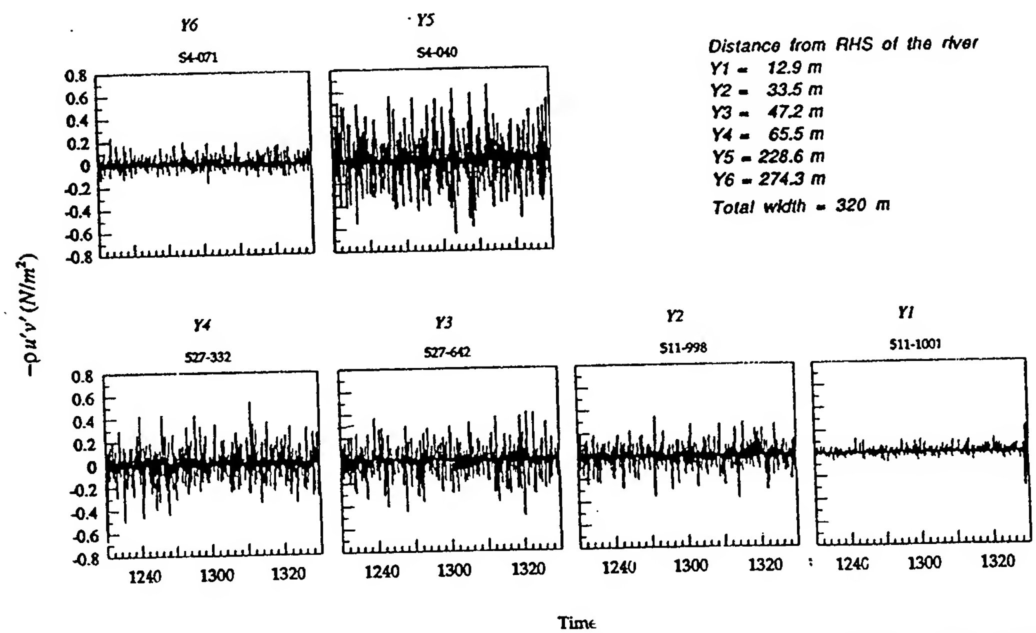

Fig. 11. Variation of instantaneous turbulent shear stresses with time for October 13, 1990 from 1230 to 1330 h.

Figure 12(b) shows the vertical variation of the time-averaged turbulent shear stress. This Figure shows that the maximum turbulent shear stress also occurs at an elevation of about 10 to 20 percent of the depth from the river bed with an associated decrease in the vertical direction. This variability is also similar to that observed for σ_x and σ_y.

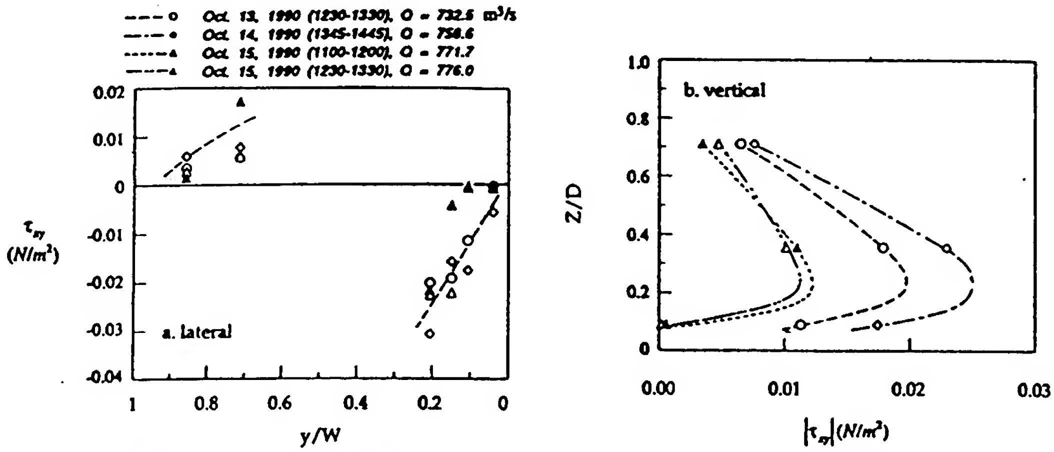

Fig. 12. Variability of turbulent shear stresses across the width of the river and in the vertical direction.

4 Conclusions

Turbulent fluctuations of flow velocities in a natural river were investigated to understand the turbulence characteristics of large rivers. The investigation included the distributions of turbulent velocity fluctuations near the bank and bed of the river. The analyses presented for u, v, σ_x, σ_y, and τ_{xy} have significant implications for the evaluation of biotic habitats in large river environments. It appears that the velocity, velocity fluctuation, turbulent intensity, and turbulent shear stress are all relatively high toward the main channel area. Moreover, all of these flow parameters decrease toward the channel border areas. Therefore, the main channel area above the river bed is the most active zone as far as turbulence is concerned. These observations are important in understanding the creation of turbulent eddies, sediment transport processes, and bank erosion mechanisms. It should also be noted that the values of σ_x, σ_y, and τ_{xy} were found to be high at elevations of 10 to 20 percent of the depth above the bed. Thus, any external disturbance that may increase or alter these natural conditions could affect the natural aquatic habitats existing at those locations during normal conditions.

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Notations

t	Time
T	Time interval
u,v,w	Velocity components
u',v',w'	Fluctuating velocity components
$\overline{u},\overline{v},\overline{w}$	Time-averaged velocity components
$-\rho\overline{u'v'}$	Turbulent shear stress
x	Longitudinal coordinate
y	Lateral coordinate
z	Vertical coordinate
σ_x,σ_y	Turbulent intensities
τ_{xy}	Turbulent shear stress

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APPENDIX XXXII.

LIST OF RELEVANT TECHNICAL REPORTS AND PRESENTATIONS PREPARED BY WATER SURVEY RESEARCHERS

Technical Reports and Presentations
Prepared by Illinois State Water Survey Researchers

Adams, J.R. 1991 *Identification of Study Approaches to Determine Physical Impacts of Commercial Navigation on the Upper Mississippi River System.* Illinois State Water Survey Contract Report 531.

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13. ABSTRACT (Maximum 200 words)

This report summarizes the investigation conducted by the Illinois State Water Survey on the physical changes associated with the movement of navigation traffic on the Illinois and Upper Mississippi Rivers. This research project was partially funded by the Environmental Management Technical Center of the U.S. Geological Survey and the U.S. Army Corps of Engineers. Project activities were conducted through the Illinois Department of Natural Resources. Research results have also been presented at technical society meetings and published in a number of journals.

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Barge traffic, current, draw down, Illinois River, Mississippi River, navigation traffic, return velocity, sediment resuspension, suspended sediment, turbidity, water quality

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